# Railway Mechanical Engineer

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### Motive Power Department:



### Car Department:



### General:



### Editorials:



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### Car Foremen and Inspectors:



### Back Shop and Enginehouse:



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Railway
Mechanical Engineer

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# Illinois Central de Luxe Cars Are Air Cooled

**A complete Westinghouse air-conditioning system is applied to 10 cars of Chicago-St. Louis "Daylight Special" train—The equipment weighs 4,500 lb. per car and includes a 15-kw. generator**

THE de luxe "Daylight Special" train of the Illinois Central, operating between Chicago and St. Louis, Mo., has recently been completely equipped with the new air-conditioning system developed by the Westinghouse Electric & Manufacturing Company. Ten air-conditioning units, each producing a cooling effect equivalent to the melting of six tons of ice in 24 hours, were installed on a total of 10 cars, including two diners, two lounge cars, two parlor cars, two chair cars and two baggage-smoking cars. Railroad forces at the Burnside (Chicago) shops of the Illinois Central performed all of the work of installing the equipment, including air ducts, distribution grills, etc.

The Westinghouse air-conditioning equipment consists essentially of three self-contained units, as follows: A 15-kw. gear-driven axle generator which supplies power for air conditioning, car lighting and battery charging; a six-ton refrigerating unit complete in one box for underframe mounting; an air-conditioning unit mounted under the car roof.

### Electrical Equipment

The necessary generator and motor controls are mounted in the customary lighting control cabinets. Since the existing generators are not required, the entire system adds only about 4,500 lb. to the car

Interior view of air-conditioned chair car

weight. No floor space is taken and the system requires no replenishment of water or similar servicing.

The power source is a 15-kw. gear-driven axle generator, designed with ample capacity to provide power for air conditioning, car lighting and battery charging. The generator is mounted on the truck in essentially the same manner as a driving motor on any electrically operated multiple-unit car. This type of drive, in successful use for many years, requires a special axle, but has the advantage of completely eliminating all belts, spline shafts, universal joints, etc. The generator and drive are suitable for application to either four- or six-wheel trucks.

The axle generator is a totally enclosed 32-45-volt machine. The frame is designed with a large number of radiating fins to take advantage of the train movement, thereby cooling the generator and enabling a large service capacity to be obtained from a small unit. The rating of the generator is 20 kw. for one hour and 15 kw. continuously. The generator, at these ratings, operates considerably below the American Institute of Electrical Engineers' allowable temperature rise for Class B insulation. The mechanical design of the generator follows standard railway motor practice.

On the commutator end of the generator shaft is located a small two-pole exciter. This exciter serves several purposes. It provides the necessary and proper excitation for the generator, and by controlling only the exciter fields with the regulator, a very conservatively applied regulator is had. The exciter is constructed with special iron in the field structure which insures high retentivity. The housing between the generator and exciter is of non-magnetic material. With an exciter of this character, the generator always builds up with the same polarity irrespective of train direction, eliminating all brush shifting devices.

**The axle-generator on the test block—End housing is removed to show the exciter and main commutator handhole**

### Gear Drive for Generator

A 1,000-amp-hr. battery is used in conjunction with the generator for supplying power during intermediate stops and at slow speeds. Tests made on the car indicate that the generator will cut in and remove the compressor load from the battery at 18 m.p.h. With the gear ratio employed on the drive, the generator is safe for continuous operation at 90 m.p.h.

The generator is directly driven from the axle by a gear unit to which it is mounted. The axle is pressed into the gear unit which is held onto the axle by two roller bearings. On the axle is mounted a flexible gear similar to those used on M-U cars and locomotives. The gear drives an idler gear which in turn drives the generator pinion. The idler gear is used because of center-sill clearance only. High angle helical gears are used throughout to prevent noise, and within the car no gear noise can be detected. The entire gear operates in oil, providing positive lubrication.

The principal objection raised to gear drives of this sort is the stress imposed on the gears when coupling trains. Tests were made with accelerometers before designing the gears, and the teeth are constructed to withstand any impact which would slip the car wheels. However, as a further protection, a flexible feature has been incorporated in the gear drive.

### Generator Control

The control for a generator to handle the loads imposed on a car should provide the full generator output at all speeds from the minimum to the maximum, but at the same time give the proper taper for battery charging. The voltage should also not vary with sudden applications of compressor loads. These conditions have been met on these cars.

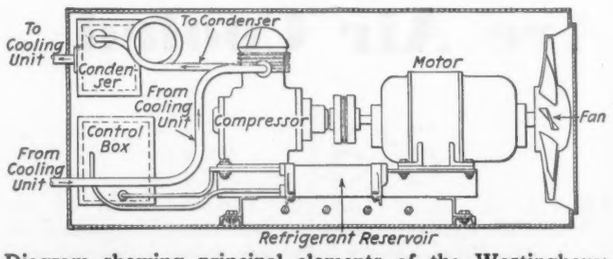
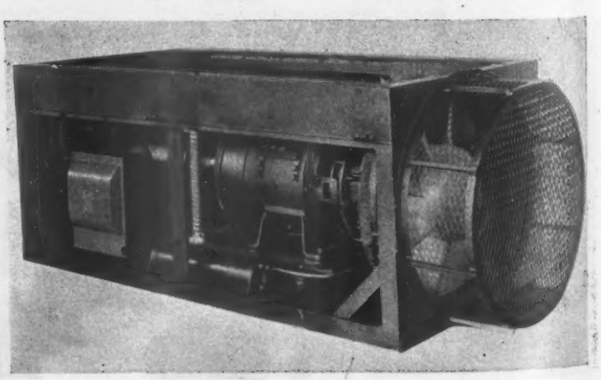



**Diagram showing principal elements of the Westinghouse Electric & Manufacturing Company's air-cooling equipment**

A regulating relay controls the exciter fields which have been divided into three sections. At low speeds, all are in series to provide maximum excitation. At intermediate speeds, part of the field is cut out, and at high speeds the differential field opposes the main field. With this system, no carbon-pile resistors are used. The regulator is extremely stable under all conditions, and maintains the voltage to plus or minus one-half volt. Application of large concentrated loads produces less than one volt fluctuation, and the voltage immediately returns to its previous value. The regulator may be adjusted for any voltage from 32 to 45 volts by means of a set screw.

A taper-charge feature for the battery, for this service, cannot be built into the regulator for it is essential that constant voltage be maintained on account of the compressor. To give the proper taper



**Six-ton refrigerating unit ready for mounting under the car**

charge, a modified constant potential-system is used, employing a series resistor in the battery circuit.

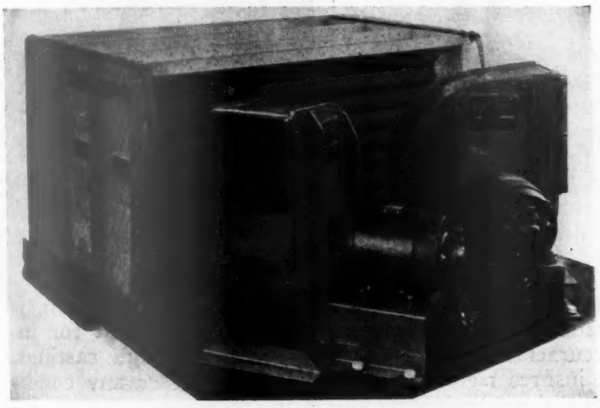
The automatic switch is mounted on the same panel as the regulator. It operates to open or close the generator circuit to the battery at a voltage differential of plus or minus one-half volt, thereby causing no surges when the generator cuts in.

### The Refrigerating System

The entire refrigerating system is mounted under the floor in one box about the size of a large battery box. This box is designed for bolting to the car underframe, and requires only two pipe connections from the cooling coils and the motor leads. The condenser is air cooled.

The equipment is readily accessible from the side of the car by unlatching two doors. In the box is contained the following apparatus. Air-cooled condenser, six-ton compressor, a.c.-d.c. motor, condenser fan, liquid receiver tank, oil separator, cut-off valves, strainer, and a.c. starting switch.

By closing a small control switch, the entire plant is placed in operation. By opening the compressor switch, however, the ventilating fans may be operated without the refrigerating system. The refrigerant used is Freon. The compressor pumps gas at high pressure into the air-cooled condenser, where it is condensed to a liquid. From there it goes to the cooling unit in the roof where the liquid expands to a gas and cools the car. It returns through an oil separator, which returns any oil to the compressor crank case, and the refrigerant passes into the compressor. The cycle is then repeated.



**Air-conditioning unit and direct motor-driven fans which are installed under the car roof**

The condenser fan is bolted to the driving motor. The motor is directly connected to the compressor and all mounted on a bed plate which is carried on rubber so that no objectionable vibration is passed to the car. The condenser is mounted in the rear of the box so that air enters at one end and goes out the rear through the condenser coils.

At the end opposite the fan are located three valves and the strainer. One valve shuts off the back-pressure line and one the high-pressure line. The third cuts off the strainer, enabling it to be removed without losing any refrigerant. Similarly, all the charge may be pumped into the receiver tank for any pipe repairs.

The principal feature of the refrigerating unit is the high-speed compressor which develops six tons of refrigeration with a weight of only 300 lb. Operating at 1,000 r.p.m., a high efficiency is said to be obtained. The crank shaft, pistons, connecting rods, bearings, etc., are all force-lubricated by an oil pump located in the crank case. Flapper valves are used.

The condenser cooling fan was especially developed by the manufacturer in its research laboratory for efficient use in this application. The fan is made entirely of aluminum.

One of the biggest problems in air conditioning of cars is that of pre-cooling. For midnight sleepers which may be parked for several hours, the use of a battery is out of the question. Wiring yards and terminals at 32 volts is expensive. Realizing this, the manufacturers designed an a.c.-d.c. motor drive for the compressor which requires no more space than a standard d.c. motor.

This motor is a two-bearing set, directly connected to the compressor. The d.c. end operates at 1,000 r.p.m., 38 volts, and rates 10 hp. totally enclosed. The a.c. end rates 15 hp. at 1,150 r.p.m., either 220 or 440 volts, 60 cycles, 3 phase. This arrangement gives universal operation from either a.c. or d.c. power. For operation at slow speeds or during intermediate stops, the battery is used. For operation above 18 m.p.h., the generator furnishes power. During pre-cooling, commercial a.c. power may be used. Another feature of this drive is the ability to charge the battery when operating from the a.c. end. By merely closing the compressor switch, the d.c. motor, operating as a generator, automatically charges the battery. The a.c. feature increased the weight of the equipment about seven per cent. This is the only motor used in the refrigerating unit.

### Air-Conditioning Units

The air-conditioning apparatus is mounted in one unit located under the car roof. The unit consists of the cooling radiators, blowers, capillary tubes and a regulating valve. A heating radiator is included for winter heating of the car.

The high-pressure line from the refrigerating unit runs to the regulating valve which controls the amount of liquid to keep a constant back pressure. From this valve, the refrigerant is distributed evenly to the radiators. Air is pulled through the cooling radiators by the blowers and then delivered to the car. A definite amount of fresh air is taken from the outside at all times through filters, and a certain amount of air re-


**Westinghouse motor-driven compressor and condenser mounted under the car body**

circulated. No expansion valves are used and only 25 lb. of Freon is needed to fill the system.

To facilitate the duct arrangement, two No. 2 Buffalo Forge fans are used, each driven by a ½-hp. motor. The fans are set at an angle of 60 deg. to eliminate any right-angle bends in the ducts. These fans deliver air in excess of 2,000 cu. ft. per min. to the car. The control is so arranged that the compressor cannot be operated without the fans, but the fans can be operated without the compressor.

All the air entering the car, either winter or summer, passes through filters and is cleaned before the warming or cooling process, as the case may be. A thermostat, which may be set for any desired temperature, controls the refrigerating apparatus whether operating from the battery, the generator or a.c. power. For winter operation, the heating radiator is used. This supplements the regulator heating system and tempers the fresh air supplied to the car.

Air is supplied to each car interior by two ducts, one along each side of the deck. Each duct has a cross-sectional area of about 100 sq. in. with uniformly spaced louvres from which the air enters the car.

Four of the Illinois Central cars, equipped with the Westinghouse air-conditioning system, have turtle-back roofs, while the other six cars have roofs of the standard monitor type. On the latter type, the air ducts, installed on the outside of the car and using the present ventilators as inlets, are designed to give a turtle-back effect. On the other cars, the ducts are installed inside the car and consist of triangular-shaped ducts, located at the deck molding on each side of the car and encased in ½-in. laminated wood which carries the deck finish and gives the monitor interior effect.

The ducts are of uniform size, the full length of the car, deflectors being provided at the louvres, so arranged as to regulate the delivery. In all cases, the air ducts are made of 14-gage steel, with 1½-in. hair-felt insulation.

## A.R.A. Report on Oil-Electric Locomotives

A CHART showing the number and aggregate horsepower of Diesel electric locomotives in the United States was published in connection with the report of the A. R. A. Committee on Locomotive Construction which appeared in the July, 1932, *Railway Mechanical Engineer*, page 267. The solid line on the chart was shown as that of "engine horsepower" while the dotted line showed the increase in the number of Diesel electric locomotives in 1925 to 1932, inclusive. This was incorrect. The full line shows the increase in the number of locomotives, while the dotted line shows the increase in engine horsepower.

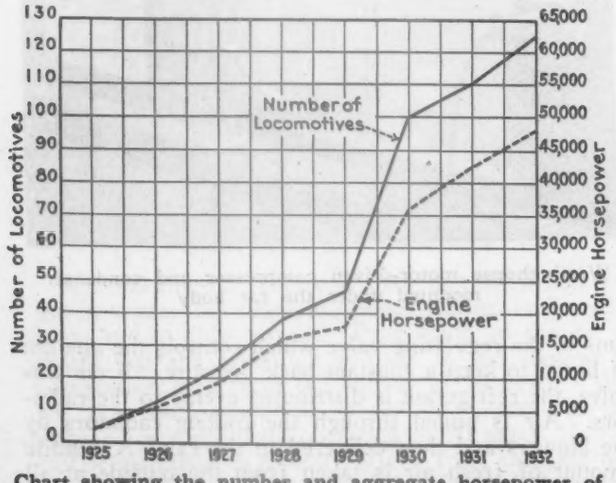
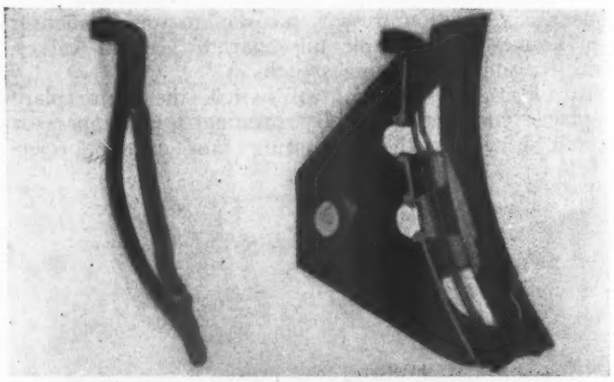



**Chart showing the number and aggregate horsepower of Diesel-electric locomotives in the United States**

## Master Brake-Shoe Key

WITH the object of meeting the problem of worn brake heads and component parts, the Buffalo Brake Beam Company, 32 Nassau street, New York, has developed what is known as the Master brake-shoe key. This key, which is shown in the illustration, is made of spring steel and provides adjustment for inaccuracies which frequently occur in rough castings. It insures rigid contact of all parts under any conditions, thus eliminating vibration and wear.

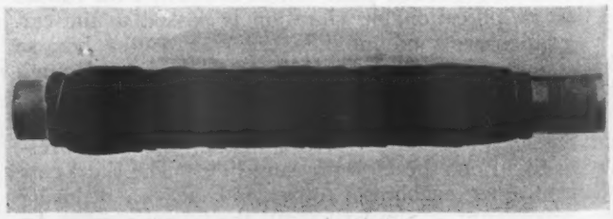


**Master brake-shoe key provides adjustment for rough castings**

## Insulating Tape For Locomotive and Car Piping

THE new design Kay-N-M locomotive and car insulating tape, manufactured by Keasbey & Mattison Company, Ambler, Pa., has a lip or feather edge that laps over the thick edge when spiralling around the pipe.

This lap prevents separation and adds to the insulating value. The tape is weatherproofed with a non-inflammable black material that will not harden and crack off, thereby saving the cost of labor and paint. This tape is complete in itself, requires no covering, is flexible and can be taken off and reapplied.



**Kay-N-M locomotive and car insulating tape**

# Santa Fe Installs 900-Hp. Articulated Rail Car

**Single-unit Electro-Motive power plant designed for speeds up to 80 miles an hour**

THE Atchison, Topeka & Santa Fe, in an effort to improve the passenger-train service on certain types of runs, has recently placed in service a 900-hp. articulated, gas-electric rail car that represents the highest powered unit built for any railroad in the country. The design of the car is unusual in that the power plant section is separate from the baggage and express compartment and the two are joined by means of a center articulated-type truck. The total length of the complete unit is 90 ft. and the total weight is 245,000 lb. As a power unit this car is capable of handling four heavy passenger cars as trailers. Speeds up to 80 miles an hour are possible.

The car bodies and trucks were built by the Pullman Car & Manufacturing Corporation and the power unit by the Electro-Motive Company, Cleveland, Ohio.

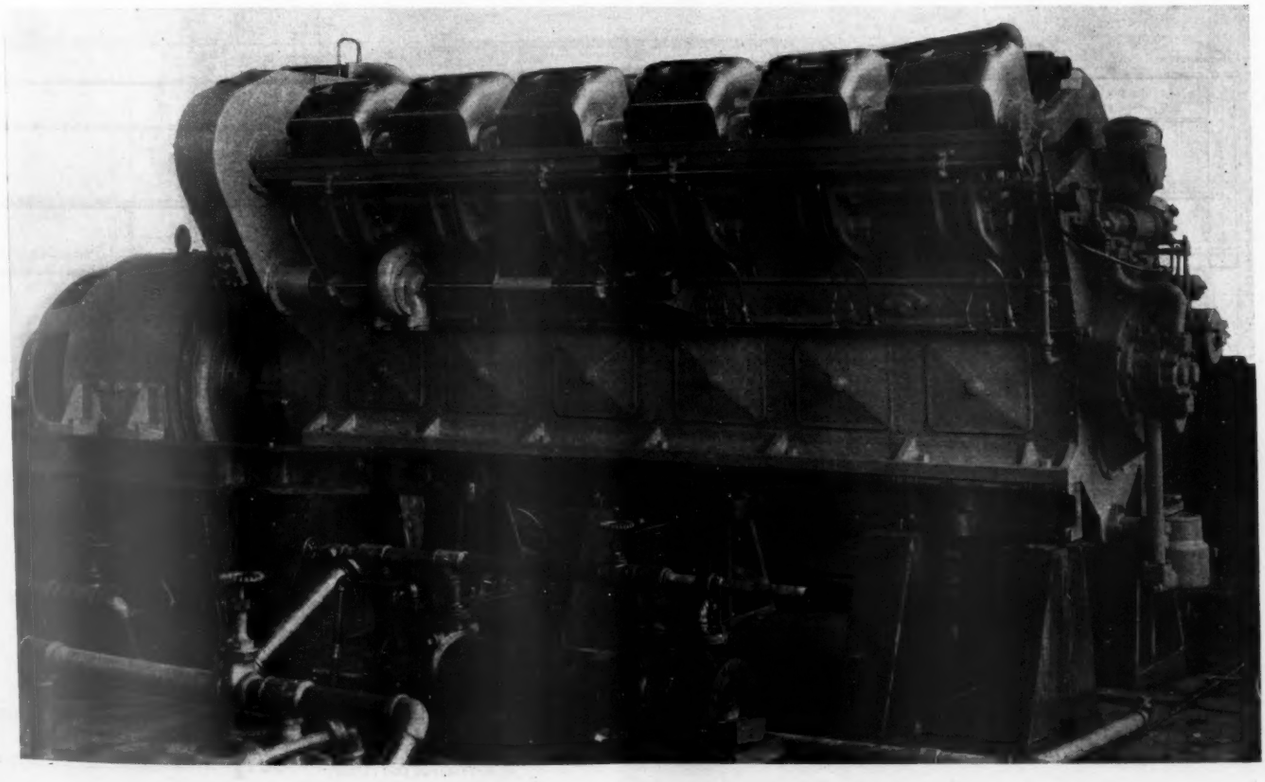
### The Power Plant

The outstanding feature of the power plant is the heavy-duty, 12-cylinder, V-type Winton engine, with a 9-in. bore and 12-in. stroke, developing 900 hp. at 900 r.p.m. Either gasoline or distillate can be used as fuel, a 780-gal. tank underneath the car being used as fuel storage. The electrical equipment consists of a General Electric direct-current generator, the necessary transmission and control apparatus and four G. E. heavy-duty railway traction motors of ample capacity to transmit the power to the driving wheels of the front and center trucks.

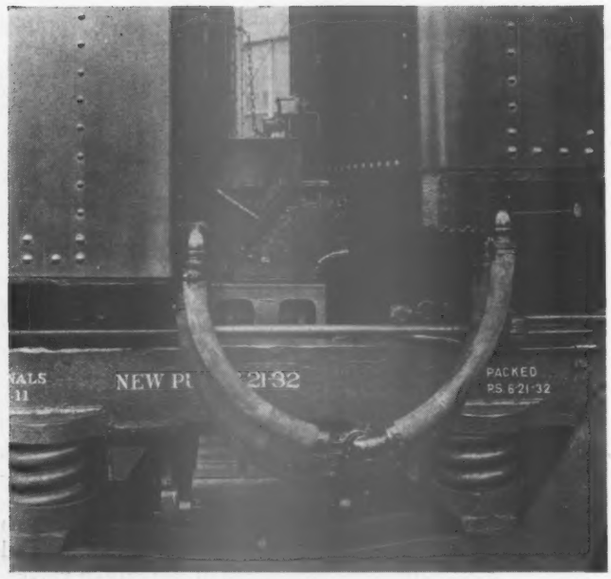
A twin-cylinder two-stage air compressor is built into the engine. It has a displacement of 70 cu. ft. per min. and can be operated at any desired main-reservoir pressure up to 150 lb.

The engine is provided with a carburetor for each cylinder for burning either gasoline or distillate, and throttling is accomplished by control of the intake valves. The purpose of the individual carburetors is to shorten the travel of the fuel and air mixture, thus allowing the use of cheap non-volatile fuels and insuring even distribution of fuel to all cylinders. It is expected that the problem of fuel distribution, the greatest drawback to the construction of large engines of this type in the past, will thus be satisfactorily solved.

Air distribution to the 12 cylinders is accomplished by a triple manifold, two branches of which pass from end to end of the engine through the cylinder heads, and with a central feeder branch running the length of a cylinder-block casting. The three branches are tied together by lateral connections. Air is brought in through felt air cleaners under the roof of the car to the central



**The 900-hp. engine on the test block at the Winton plant**




**A view of the articulated joint construction and hose connections between the power unit and the trailer section**

feeder branch of the manifold and distributed to the other two branches through the lateral pipes.

### Fire Hazard from Back Firing Eliminated

This arrangement which distributes air alone, picking up fuel at the intake valve of each cylinder, eliminates the handling of any fuel and air mixture, outside of the cylinders and so eliminates fire hazard from back fires.

The engine has two exhaust valves on each cylinder, and advantage is taken of the angle of the cylinder so as to lead the exhaust outlet directly upward from the cylinder head in an individual exhaust pipe to a combined manifold and muffler above the car roof.

Twenty-four exhaust valves are operated by individual rocker arms, actuated directly from the two cam shafts, and these individual rocker arms are provided with automatic lash adjusters, which eliminate the necessity for the adjustment of valve tappet clearance. The inlet valves, being hydraulically operated and controlled, also require no clearance adjustment.

Each cylinder has an individual head. These heads are aluminum alloy and are fitted with aluminum bronze valve seats which are highly resistant to gas erosion.

The generator is of the single-bearing type, with built-on exciter and differential field control of the voltage which has become conventional for all classes of motor cars, and is unusual only in that the exciter is not used for battery charging.

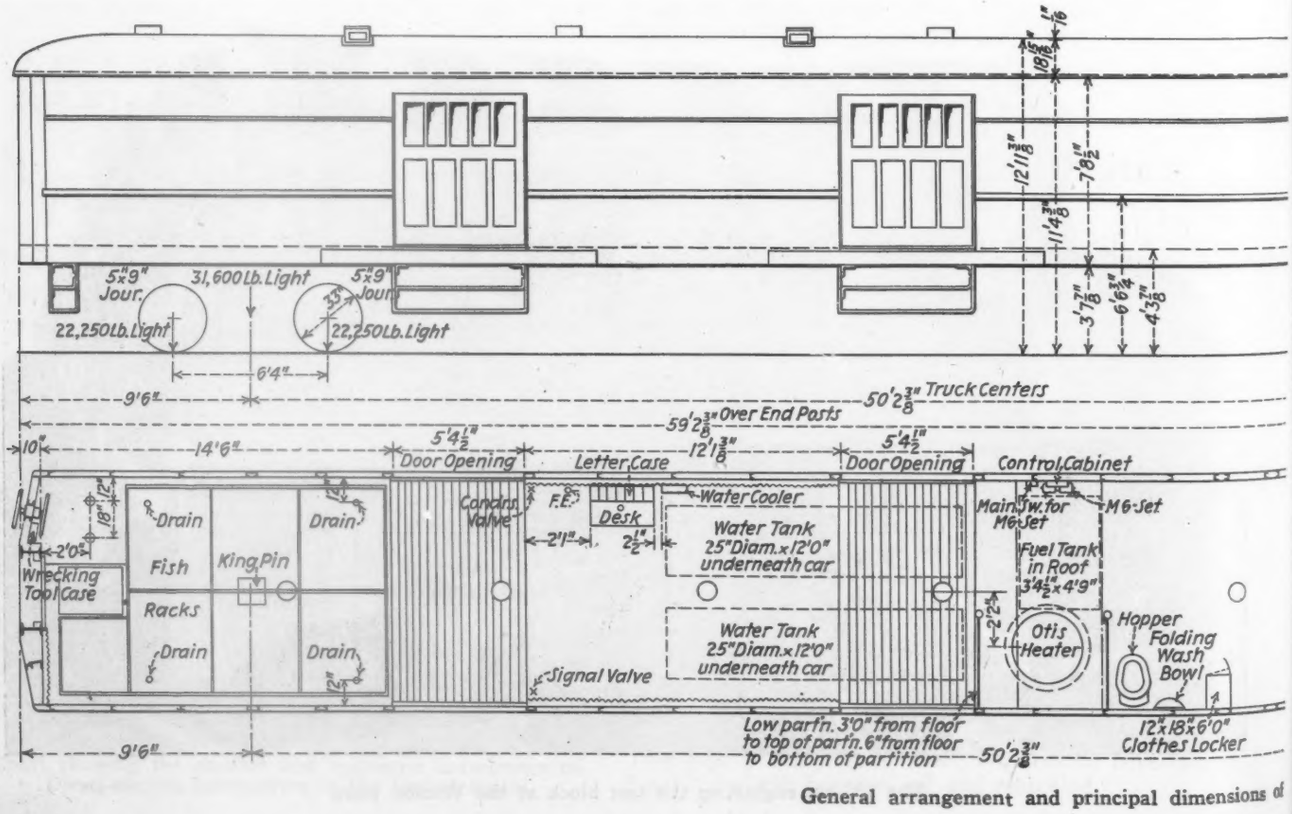
The batteries for engine starting and car lighting are charged when the power plant is working from an independent generator, delivering the current at constant voltage and not affected by engine speed.

When the engine is idling, the batteries are charged from the main generator. Provision is made in the battery-charging generator to reduce the charging rate to a trickle charge when the battery is full, thus preventing gassing, overheating and plate deterioration.

### Traction Motors of New Design

The traction motors are of new design, with roller bearings on the armature shaft and with commutator construction and armature banding designed for car speeds up to 80 miles an hour.

Cooling air for these traction motors is brought down through ducts from the interior of the car body and the entrance of air to the car body is confined to the front, thus providing the cleanest possible air for cooling the motors and avoiding the problem of dust stirred up by the passage of the car.



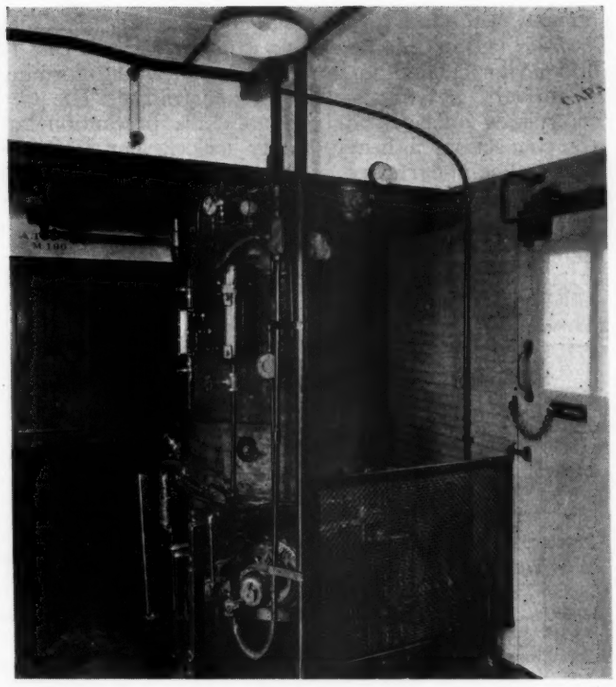

**General arrangement and principal dimensions of**

The use of roller bearings on the traction-motor armatures eliminates the necessity of attention to waste-packed bearings, which, on large motor cars, are difficult to reach. Similarly, all other details of the power plant, as well as of the car itself, have been developed with a view to minimum attention during an extensive service life. Full provision has been made for the ready inspection, lubrication and repair of such parts as require this attention periodically under ordinary service conditions.

### Details of the Car Design

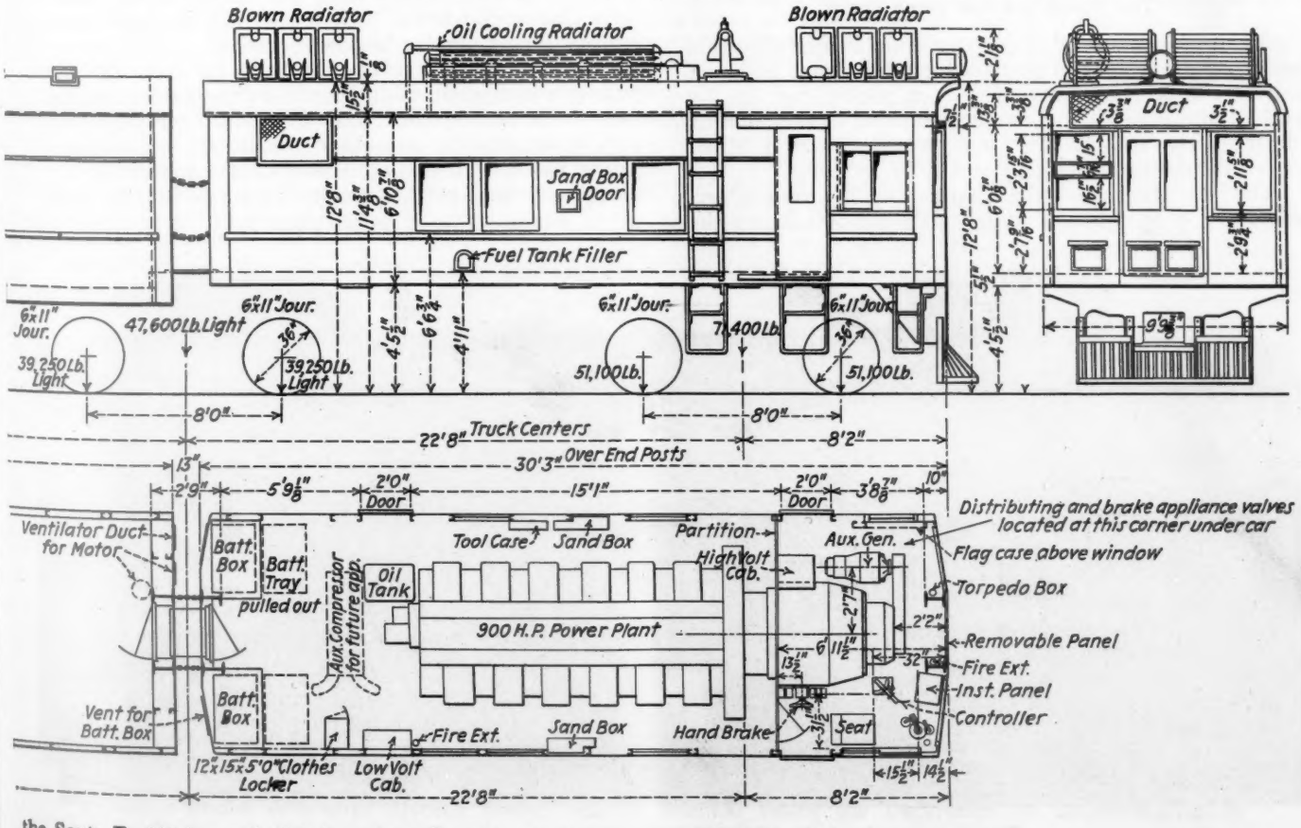
The front section, housing the power unit is 30 ft. long and the rear section is 60 ft. long. The operator's compartment in the front of the power section is separated from the engineroom by a partition, and ventilation for the engineroom, itself, is provided by an air duct from the front of the car. This partition dampens engine noises, and allows the operator to control the amount of draft in his compartment without interfering with the passage of the large amount of air required for ventilation of the engineroom. All instruments are located for convenient visibility from the operator's position, engine-control and air-brake levers being within easy reach. A safety control feature is incorporated and operated by a foot lever. Westinghouse ET-6 brake equipment is installed with the H-6 automatic valve and S-6 independent valve mounted on a brake-valve pedestal.

The trailing section of the car carries a steam heating boiler capable of evaporating 1,000 lb. of water per hour, or sufficient to heat four cars in severe weather and five cars under ordinary weather conditions. The Otis vertical fire-tube flash-type boiler, furnished complete with all controls by the Vapor Car Heating Company, is designed for safe and entirely automatic operation. It is notable for compact design and develops a thermal efficiency of about 92 per cent. On account of provisions for the future installation of a 15-ft. mail compartment in the forward end of the trailing section, the heating boiler is located near the center of the baggage compartment.



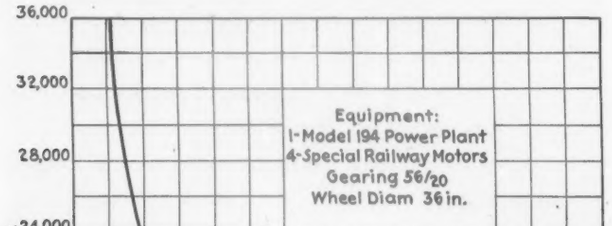
**An Otis vertical flash-type boiler for heating is located in the baggage compartment**

The underframe of the forward or power section of the car is a one-piece steel casting which also serves as a




**the Santa Fe 900-hp. articulated power rail car**

common bed plate for the engine and the generator. The rear end of this power-plant underframe is cast to form an articulated joint with a steel casting forming the forward end of the trailer underframe. The two centerplates interlock and, as an extra precaution for safe connection, a heavy, safety locking bar is introduced. The underframe of the power unit and the end sill of the trailing baggage unit were made by the General Steel Castings Corporation, Commonwealth division.



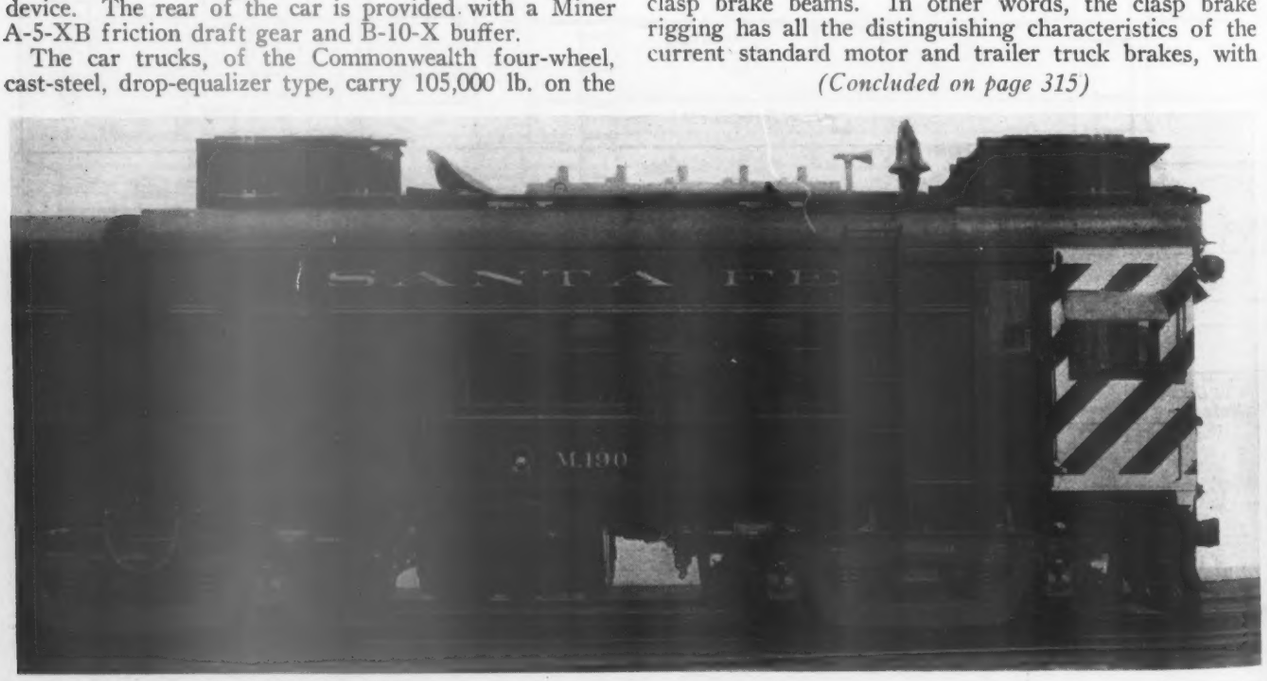

**The speed tractive force curve**

As the car is intended for operation in one direction only, no draft gear is provided on the front end. A swivel coupler only, mounted in a pocket cast at the end of the underframe, is furnished without a buffing device. The rear of the car is provided with a Miner A-5-XB friction draft gear and B-10-X buffer.

The car trucks, of the Commonwealth four-wheel, cast-steel, drop-equalizer type, carry 105,000 lb. on the front truck; 90,000 lb. on the middle truck and 50,000 (light) on the rear truck. The two power trucks have 36-in. rolled-steel wheels and the trailer truck 32-in. Davis cast-steel wheels. All trucks are equipped with Simplex Unit-Cylinder brakes furnished by the American Steel Foundries. The leading and intermediate trucks are equipped with a beamless clasp brake rigging, whereas the trailer-truck clasp brake has the customary clasp brake beams. In other words, the clasp brake rigging has all the distinguishing characteristics of the current standard motor and trailer truck brakes, with

*(Concluded on page 315)*

**The operator's compartment, showing instruments and control apparatus**




**The power unit of the Santa Fe 900-hp. articulated power rail car**

# Regulation of Smoke in Hudson County, New Jersey

**Railroads are successfully co-ordinating work of fuel economy and locomotive and enginehouse operation with that of smoke abatement—An improvement of 83 per cent in locomotive smoke emission was made in seven months**

HUDSON County, New Jersey, established a Department of Smoke Regulation in December, 1930, under the jurisdiction of the Board of Health and Vital Statistics. An ordinance relating to smoke abatement was adopted by this board and passed by the Board of Chosen Freeholders on January 23, 1931. The necessary work pertaining to the organization of the department was completed by May, 1931, in which month the department's smoke inspectors began to make complete observations of smoke violations. During the seven months' period May to December, inclusive, the percentage of violations by locomotives was reduced from 34.2 to 5.8, an improvement of 83 per cent, and the violations by enginehouses was reduced from 75 to 8.2 per cent, an improvement of 89 per cent.

This record of railroad smoke abatement is obtained from the annual report for the first year's work of the department, which was prepared by William G. Christy, smoke-abatement engineer in charge of the department.

When the department started to function, the railroads were considered to be making more smoke than any other class of fuel user. This was due to the fact that the railroads are one of the largest users of soft coal, and also because Hudson County contains some of the largest railroad terminals in the United States. The Communipaw yards of the Central of New Jersey, which are located in Hudson County, are considered to be one of the largest steam railroad terminals in the world.

There are nine railroads which operate each day approximately 1,150 steam locomotives in Hudson County.

**Table 1—Results of Smoke Observations from Locomotives**

| 1931 | No. observations made | No. violations observed | Per cent violations of observations |
|---|---|---|---|
| April | 10 | 5 | 50.0 |
| May | 823 | 281 | 34.2 |
| June | 883 | 156 | 17.6 |
| July | 847 | 128 | 15.1 |
| August | 862 | 102 | 11.8 |
| September | 795 | 96 | 12.1 |
| October | 837 | 148 | 17.7 |
| November | 854 | 56 | 6.6 |
| December | 850 | 49 | 5.8 |
| Total | 6,761 | 1,021 | |

At the beginning of the campaign with the railroads, all the roads were burning high volatile bituminous coal and only a few were using air induction tubes.

### The Hudson County Smoke Ordinance

During the first few months of 1931 the attention of the department was focused on plans to enforce the new smoke ordinance and to solve the railroad smoke problem. Articles 3 and 3a of the Smoke Ordinance read as follows:

*Article 3.*—The production or emission within the county of smoke, fly ash, or fumes, the shade of which is equal to, or greater than, No. 3 of the Ringelmann Chart, or which is so dense as to prevent seeing through it at the point of emission into the external air, from any stack or open fire, except that of a locomotive or steamboat, for a period or for periods aggregating 2 min. or more in any period of 15 min., and the emission of such smoke, fly ash, or fumes from any locomotive or steamboat for a period or for periods aggregating 30 sec. or more in any period of 3 min., is hereby prohibited.

*Article 3a.*—The production or emission within the county of smoke, fly ash, or fumes, the shade of which is equal to or greater than No. 2 of the Ringelmann Chart, or which is so dense as to be dimly seen through at the point of emission into the external air, from any stack or open fire, except that of a locomotive or steamboat, for a period or for periods aggregating 12 min. or more in any period of one hour, and the emission of such smoke, fly ash or fumes from any locomotive or steamboat for a period or for periods aggregating 4 min. in any period of 15 min. is hereby prohibited.

The ordinance requires the use of the Ringelmann

**Typical condition at a large Hudson County railroad terminal before the Department of Smoke Regulation started its campaign**

Smoke Chart as published and used by the United States Bureau of Mines. "Smokeless fuel" is defined as a fuel containing less than 21 per cent volatile. The ordinance is not burdened with a large number of engineering details relative to boiler settings, fuels, etc. Such details are incorporated in rules and regulations of the department as authorized by the ordinance.

The Department of Smoke Regulation reports to the Board of Health and Vital Statistics of Hudson County. It consists of an advisory board of three engineers, who serve without pay; a smoke-abatement engineer, who is in charge of the department, and one or more deputy smoke-abatement engineers, who serve as assistants to the department head.

**Table II—Results of Observations of the Smoke Jacks on Enginehouses**

| 1931 | No. observations made | No. violations observed | Per cent violations of observations |
|---|---|---|---|
| May | 28 | 21 | 75.0 |
| June | 8 | 6 | 75.0 |
| July | 42 | 1 | 2.4 |
| August | 35 | 6 | 17.1 |
| September | 32 | 3 | 9.4 |
| October | 29 | 3 | 10.3 |
| November | 48 | 2 | 4.2 |
| December | 73 | 6 | 8.2 |
| Total | 295 | 48 | |

The Hudson County Smoke ordinance has been widely accepted as one of the most progressive yet developed. It has been used in a number of instances as a guide in the preparation of similar ordinances for other communities.

### Railroads Co-operate Through an Association

In solving the problems of railroad smoke elimination, the Department of Smoke Regulation adopted a policy of enlisting the co-operation of the nine railroads in Hudson County. The Advisory Board of the department, which consists of Dr. Harvey N. Davis (chairman), president of Stevens Institute of Technology, Hoboken, N. J.; Dr. Roy V. Wright, editor, *Railway Mechanical Engineer,* and Col. Elliott H. Whitlock, research professor, Stevens Institute of Technology, consulted with the interested executive officers of the various railroads concerned. These conferences resulted in the adoption of the present co-operative policy which has been the major factor in securing the results recorded in the first annual report of the department.

The Railroad Smoke Association of Hudson County was organized March 5, 1931. G. H. Massy, master mechanic, Central of New Jersey, was elected the first president of the association. He was succeeded this year by W. L. Gorton, district road foreman and fuel supervisor, Erie, with headquarters at Jersey City. A second association, known as the Marine Smoke Association of Hudson County, was formed on April 29, 1931. The membership in this association is composed of representatives of the marine departments of the railroads, steamship companies and towboat companies.

The monthly meetings of the Railroad Smoke Association have been well attended. Emphasis has been laid on the economic phases of saving fuel to prevent smoke. Several technical papers on front-end design, drafting, etc., have been presented at different meetings. Complaints to the Department of Smoke Regulation of smoke by locomotives have been referred to the railroad involved and handled by the local representative of the mechanical department. In case of complaints, a visit is made by the railroad's representative to the person complaining. Such visits generally result in the clearing up of misunderstandings and, in at least one instance, brought business to the railroad. The sincere efforts which the railroads operating in Hudson County have made to eliminate smoke and dirt have been an important factor toward building good will.

**Table III—Locomotive Smoke Performance**

| Month | Passenger service, per cent smoke density | Freight service, per cent smoke density | Switching service, per cent smoke density | Total per cent smoke density |
|---|---|---|---|---|
| May | 24.8 | 23.2 | 17.8 | 23.5 |
| June | 23.0 | 21.1 | 14.6 | 21.1 |
| July | 17.8 | 20.6 | 11.5 | 17.0 |
| August | 17.1 | 24.4 | 11.0 | 17.4 |
| September | 18.6 | 22.9 | 10.9 | 18.0 |
| October | 16.7 | 26.0 | 16.5 | 18.5 |
| November | 9.1 | 10.4 | 7.2 | 9.0 |
| December | 7.6 | 8.15 | 4.0 | 6.86 |

### Method of Operation and Results

Mr. Christy, in his first annual report, a summary of which is given in the following paragraphs, stated that when this department started to operate the railroads were doubtless making more smoke than any other class of fuel user. For that reason the attention of the department was centered, during the first few months, on the railroad smoke problem. Members of the Advisory Board called on the presidents and operating vice-presidents of all the roads operating in the county. These

**Passenger locomotives used in commutation-train service standing on the ready tracks at a Hudson County engine terminal—Note the absence of smoke issuing from the stacks**

officers were invited to send representatives to the first smoke-abatement meeting on February 4, 1931. At this meeting the proposed method of operating was explained and the railroads were invited to organize their own association for the purpose of holding monthly meetings and of carrying on the work of railroad smoke abatement.

Table I shows the monthly readings made on locomotives and violations observed. The last column shows the percentage of observations made which are violations of the ordinance. In May, the first month in which more than a few readings were taken, 34.2 per cent of the observations made were violations. In December, seven months later, this was reduced to 5.8 per cent.

Observations of enginehouse jacks were also made. Smoke from this source is mostly due to the building of fires in locomotives. This often gives more smoke trouble than any other railroad operation, especially if the proper amount of time is not taken. The results of this work are shown in Table II, the last column of which represents the percentage of violations of the total number of observations for the month. Because of the small number of readings taken, this percentage varies greatly. There has, however, been a great improvement in smoke from enginehouses.

Referring to Table III, showing the locomotive smoke performance, a total of 840 Ringelmann chart readings were made on locomotives during the month of May. The number of readings made on each railroad during the month are in proportion to the number of locomotives operating in Hudson County. For example, the Central of Jersey had 245 locomotives in service in Hudson County during May. The total number of locomotives in service in Hudson County for all nine railroads was 1,019. Thus, the Central of New Jersey was operating during the period in question 24.1 per cent of the locomotives in the county. The proportion of readings taken on Jersey Central locomotives during May was 24.1 per cent of the total of 840 readings, or 204.

**Table IV—Locomotive Smoke Performance for the Year 1931**

| Railroad | Passenger | | Freight | | Switch | | Average | |
|---|---|---|---|---|---|---|---|---|
| | No. | Avg. | No. | Avg. | No. | Avg. | No. | Avg. |
| No. 1 | 1,098 | 7.96 | 243 | 14.51 | 268 | 2.00 | 1,609 | 7.95 |
| No. 2 | 866 | 13.03 | 306 | 16.40 | 270 | 6.12 | 1,442 | 12.45 |
| No. 3 | 193 | 18.79 | 72 | 13.99 | 117 | 11.38 | 382 | 15.62 |
| No. 4 | 274 | 18.23 | 190 | 17.86 | 291 | 12.21 | 755 | 15.82 |
| No. 5 | 163 | 15.25 | 45 | 20.08 | .... | .... | 208 | 16.34 |
| No. 6 | 53 | 22.95 | 27 | 15.38 | 13 | 10.26 | 93 | 18.98 |
| No. 7 | 61 | 21.13 | 81 | 23.56 | 68 | 20.54 | 210 | 21.88 |
| No. 8 | 1,126 | 25.72 | 221 | 28.74 | 240 | 22.21 | 1,587 | 25.61 |
| No. 9 | 148 | 28.32 | 9 | 7.03 | .... | .... | 157 | 27.09 |
| Total ..... | 3,982 | 16.77 | 1,194 | 18.91 | 1,267 | 11.00 | 6,443 | 16.03 |

No., number of locomotives in service in Hudson County. Avg., average smoke density, per cent.

All of the nine roads are proportioned on the same basis. Thus, the roads operating a small number of locomotives are judged on the same basis as those which operate a large number of locomotives. Readings are made at different times during the day and on different days of the week on each road.

All readings are recorded in duplicate. A copy is sent to the officer on each road who is responsible for smoke elimination. The percentage of smoke is figured according to the Ringelmann chart and is recorded for each reading. The amount of smoke based on a No. 1 Ringelmann chart is the equivalent of 20 per cent; No. 2 chart, 40 per cent, and is increased by 20 per cent for each chart up to No. 5, which is equivalent to 100 per cent. At the end of each month these readings are totaled for each class of service, as shown in Table III.

Table IV shows the locomotive smoke performance for the year 1931. This table shows the comparative standing of the nine railroads which operate in Hudson County. A similar report, including the names of the railroads, showing the smoke performance of locomotives during each month is prepared and copies are mailed to each railroad. In making up these monthly reports the standing of the nine railroads is determined by their average percentages of smoke shown by the readings. These monthly reports are posted on bulletin boards around railroad shops and engine terminals for the information of the employees. This has resulted in considerable rivalry between different railroads in the country to secure the best record and has been an important factor in creating interest in smoke elimination and fuel conservation.

The penalty for violating the smoke ordinance is a fine of $50, or 30 days, or both. Only one complaint was filed with the court during the year 1931. This was a violation by the stationary plant of an industrial concern. The policy of the department is to work constructively with the railroads and industries to secure their co-operation in the elimination of smoke, in preference to resorting to legal action.

## Santa Fe Installs 900-Hp. Articulated Rail Car

*(Continued from page 312)*

the addition of the Unit-Cylinder feature, which consists of two air-brake cylinders applied at the inside ends of the truck frames. The brake cylinders actuate horizontal equalizers supported from the truck frame, and these equalizers, through the medium of pull rods, transfer the required braking power to the brake shoes.

The Unit-Cylinder brake makes unnecessary the use of body brake rigging, leaving that portion of the underframe between the trucks available for the application of gas and water tanks, electrical and other special equipment.

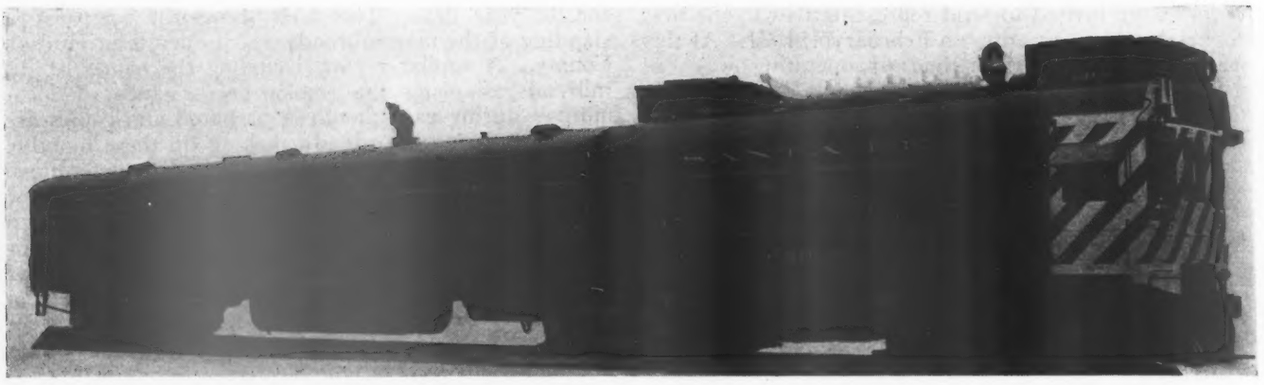
Other advantages of this construction include the elimination of considerable lost motion, vibration and noise, possibility of shorter, smoother stops, greater ease of inspection and repair, and absence of any interference with truck swiveling on curves.

In designing the power unit, thought was given to providing accessibility to the traction motors so that they could be readily inspected and lubricated. All pipes extending over this portion of the truck were kept high on the car body and low on the truck in order to improve the condition and help the maintainer.

### Equipped With Adjustable Pilot

The front end of the power unit is striped black and white to attract attention and minimize the possibility of grade-crossing accidents. Pilot application is arranged for easy removal, or adjustment to give the required height above the rail, dependent upon wheel wear and other operating conditions. The air and steam connections between the two units are of such design that standard 1⅛-in. signal and 1¼-in. air hose can be used. The steam joint between the two units is a metallic ball joint design. Sand for the wheels of the center and front trucks is brought down through pipes from a sand box on each inside wall of the power unit.

Behind the operator's station is a compartment which contains the main engine, electric locker and batteries. The battery location inside and at the rear of the engine-room was chosen for greater accessibility and in order to add weight to the center truck. The batteries are of



**Santa Fe 900-hp. articulated rail car ready for service**

the Exide MVAH-25 type, having 32 cells and 450-amp.-hr. capacity. The entire floor of the cab and engine-room is covered with linoleum in order to promote cleanliness. All doors in the power unit are of the sliding type, in the interests of safety. Convenient locker space is available in the engine-room for the use of the operator. In addition, containers have been installed for instruction books, torpedoes, flags, etc., thereby further inviting neatness in handling the car.

## Gasoline Locomotives For Light Switching

TO meet a demand for a light switching locomotive which can be maintained and operated at a minimum of expense, the Lima Locomotive Works, Inc., 60 East Forty-Second street, New York, has placed on the market two gasoline locomotives of 100 hp. and 200 hp. capacity. Both locomotives are of the


**Lima gasoline locomotive Type L-100-G**

mechanically driven four-wheel type and have the power, traction and rugged construction essential to dependable operation.

All driving connections between the motor and the wheels are accomplished by means of gears and clutches. This positive drive to both axles makes all four wheels driving wheels. It is a similar drive to that used on Shay geared locomotives. As no chains or side rods are used, maintenance and adjustments are minimized. All shafts and axles are equipped with roller bearings which are completely enclosed and run in oil.

The spring arrangement provides a true three-point suspension without the use of cross-equalizers. The locomotive adjusts itself readily to rough and uneven track, and speedy operation is made possible without danger of derailment.

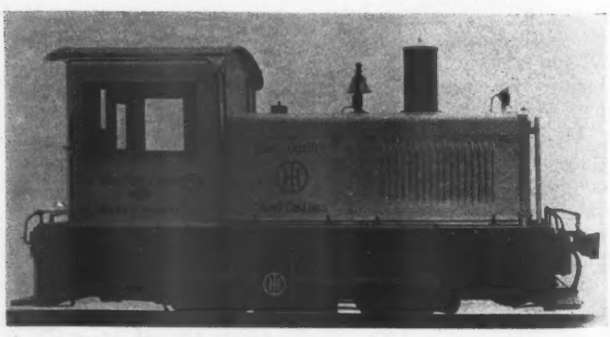
A special air-brake system has been developed for this service. It operates the brakes on cars having standard automatic air-brake equipment directly in conjunction with the air brake on the locomotive. This system enables these locomotives to spot cars accurately and quickly and to safely descend steep grades with heavy loads. The short wheel base permits the locomotives to negotiate sharp curves.

A standard Hercules straight type, four-cylinder engine, 6⅜ in. by 7 in., delivering 100 hp. at 1,200 r.p.m., equipped with electric starter, is used on the Type L-100-G locomotive, while a Le Roi eight-cylinder, V-type engine, 6¾ in. by 7 in., delivering 200 hp. at 1,000 r.p.m., with electric starter, is used on the Type L-200-G locomotive.

**Specifications for Lima Gasoline Locomotives**

| | Type L-100-G | Type L-200-G |
|---|---|---|
| Weight in working order | 30,000 lb. | 60,000 lb. |
| Gage of track—All gages | 36 in. up to 56½ in. | 36 in. up to 56½ in. |
| Wheel base | 6 ft. | 7 ft. |
| Number of driving wheels | 4 | 4 |
| Diameter of driving wheels | 33 in. | 38 in. |
| Standard height | 10 ft. 3 in. | 10 ft. 6 in. |
| Length over bumpers | 14 ft. 0 in. | 18 ft. 4 in. |
| Width for 56½-in. gage | 8 ft. 10 in. | 10 ft. 0 in. |
| Factor of adhesion | 3.59 | 3.43 |
| Fuel capacity | 50 gal. | 100 gal. |
| Drawbar pull at various speeds * | 8,350 lb. at 3 m.p.h. | 17,500 lb. at 3 m.p.h. |
| | 5,600 lb. at 6 m.p.h. | 15,000 lb. at 4.5 m.p.h. |
| | 4,200 lb. at 9 m.p.h. | 9,200 lb. at 7.2 m.p.h. |
| | 3,100 lb. at 12 m.p.h. | 6,700 lb. at 9.5 m.p.h. |
| | 2,300 lb. at 15 m.p.h. | 4,100 lb. at 15 m.p.h. |

* Actual pulls developed on dynamometer tests.



**Type L-200-G gasoline locomotive built by Lima**

Maximum power is transmitted to the driving axles, with minimum friction, resulting in a powerful, efficient unit that can be operated under the widest range of conditions with minimum maintenance.

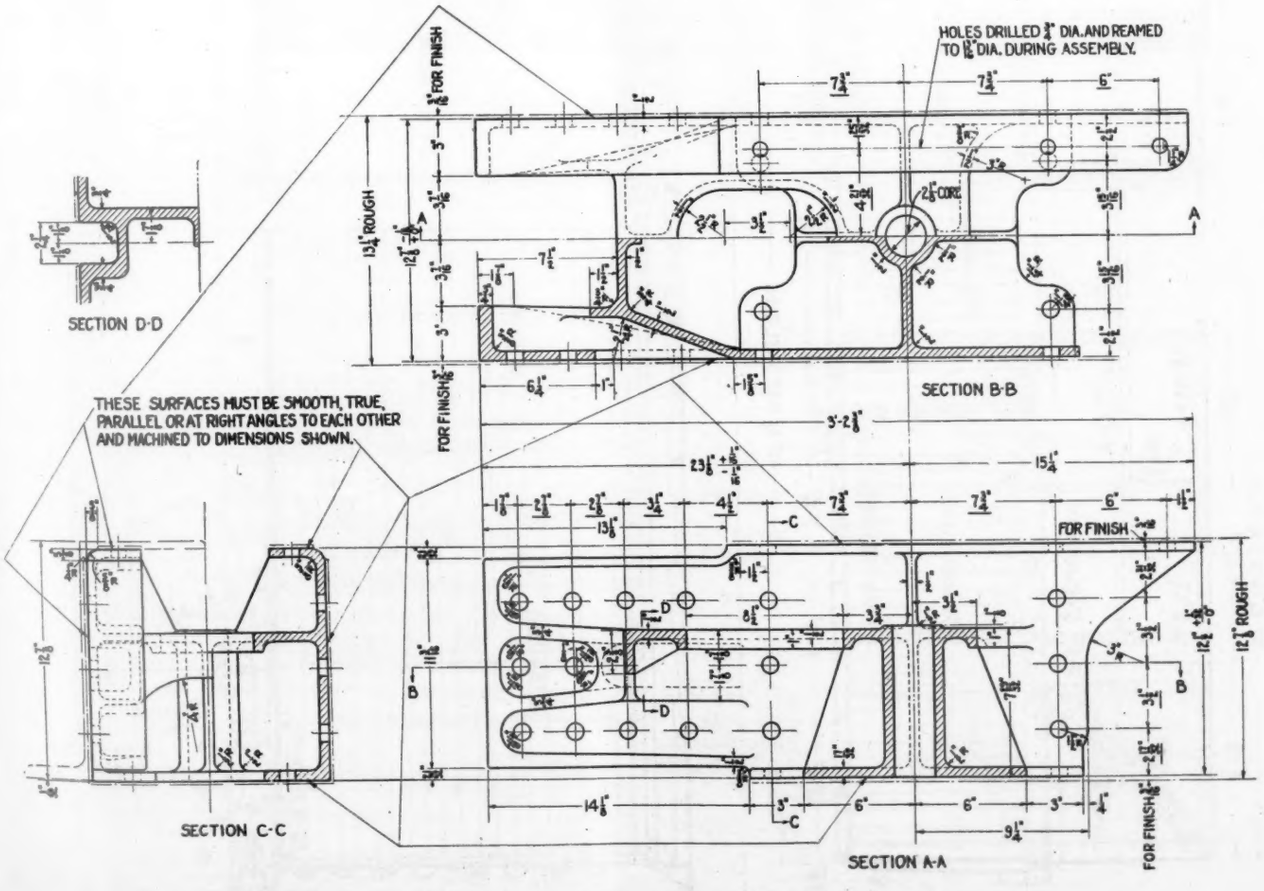
# All-Steel Box-Car Design Presented to Mechanical Division

**Design for a steel-sheathed wood-lined car for generally unrestricted interchange service differs materially from that originally presented before the Mechanical Division in 1923—The Car Construction Committee estimates a saving in weight of 1½ tons**

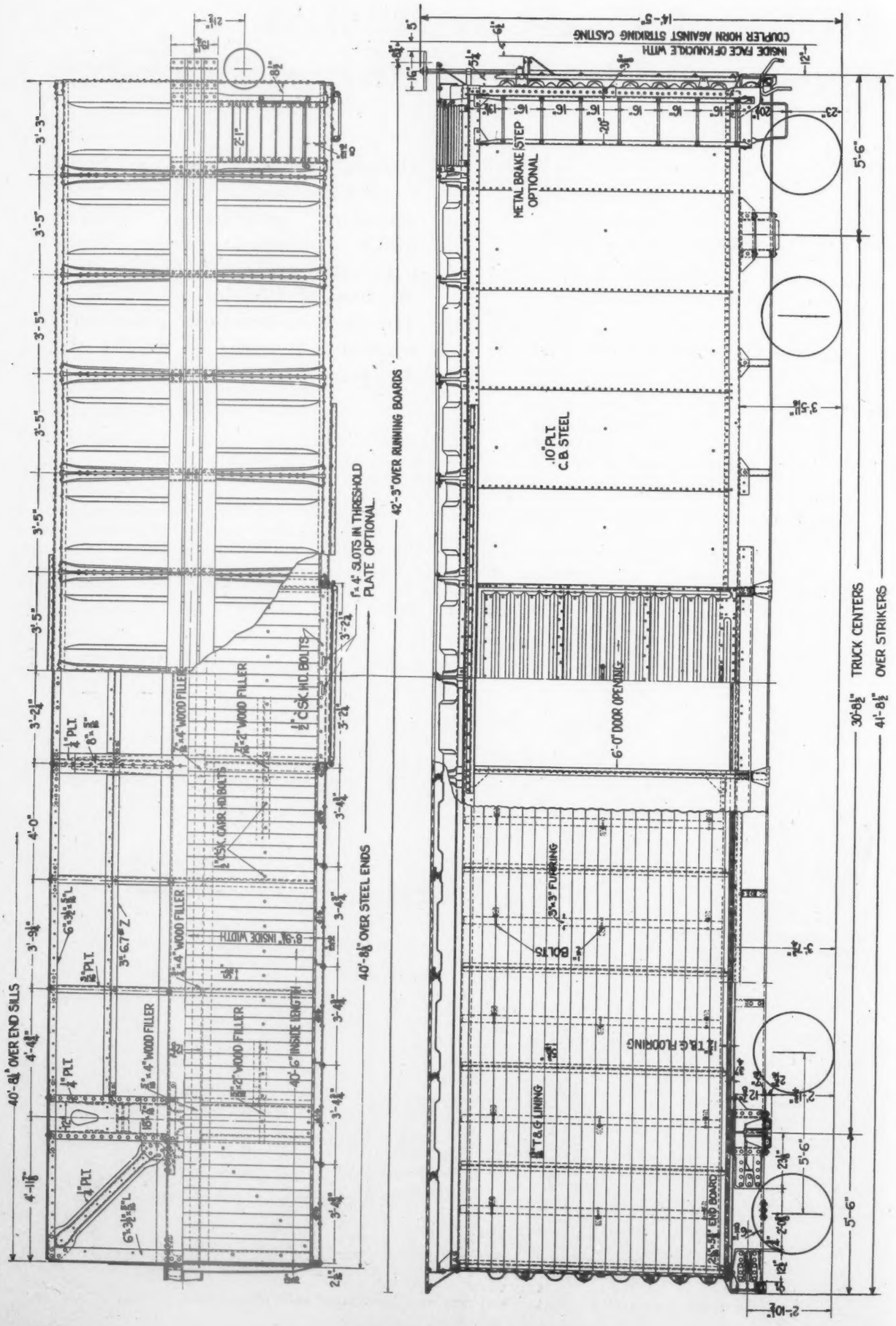
A COMPLETE new design for a steel-sheathed wood-lined box car suitable for generally unrestricted interchange service has been developed by the Car Construction Committee, Mechanical Division, American Railway Association, the Committee on Car Design of the American Railway Car Institute co-operating, and was presented at the meeting of the Division held at Chicago, June 23-24, for approval as recommended practice. The inside dimensions of the car are 40 ft. 6 in. long by 8 ft. 9⅛ in. wide and 9 ft. 4 in. high, and the light weight is estimated at 43,350 lb. The design represents a marked departure from that presented to the Mechanical Division in 1923, the inside height of which was limited to 8 ft. 7⅜ in., and in several respects it departs from the recommended practice and existing fundamentals of the Mechanical Division.

The 1923 design was never adopted because of disagreement on general dimensions, and no further consideration was given to it until in 1929 the Car Construction Committee was again assigned to undertake the development of a standard-practice car of this type. Since that time the limiting clearance outline has been thoroughly rechecked and at this year's meeting the committee presented a complete design developed in co-operation with the engineers of the car builders under a plan representing a redefinition of standardization and a re-appraisal of its purposes.

The purpose of the committee was "to produce a design representing the latest state of the art with reference to weight, cost, construction, strength and general utility so that when completed it would be too attractive for railroads to disregard and would be of such character that any road might properly and consistently adopt the design as standard and construct its future cars thereto." In comparison with the 1923 design,




**The bolster center filler and rear draft-gear stop for vertical yoke attachments**




The base car equipped with the latest designs of proprietary doors, ends and roofs

using 50-ton trucks in each case, a calculated saving in weight of 2,950 lb.* has been effected, with the corresponding increase in the load-limit capacity and an increase in clear lading space, due to the increased height, of 266 cu. ft. It represents the largest inside width and height which can be built and freely interchanged without restrictions of consequence.

In presenting the design, the Car Construction Committee emphasized the fact that roads finding it necessary or desirable to provide for restricted use box cars of inside dimensions larger than those shown may follow substantially the base design now submitted and effect a saving in weight as compared with previous constructions designed for the same dimensions.

Table I shows a comparison of the weight, load-limit capacity and cubic capacity of the new design and the design previously submitted for this type of car, developed from calculations and stenciled weights of existing equipment, the comparison being made with 50-ton trucks in each case.

The principles of the plan on which it proceeded in the development of the new design are stated by the committee as follows:

(a) Disregard existing A.R.A. fundamentals, design standards and recommended practices pertaining to car body construction and details, where, if followed, the efficiency and value of the design as a whole would be adversely affected.

**Table I—Weight Comparisons**

| | Previous design | New design | | Difference (+) or (—) for new design | |
|---|---|---|---|---|---|
| Clear inside height .... | 8 ft. 7 in. | 8 ft. 7 in. (For comparison) | 9 ft. 4 in. (As designed) | 8 ft. 7 in. | 9 ft. 4 in. |
| Light weight. | 46,300 lb. | 42,650 lb. | 43,350 lb. | —3,650 lb. | —2,950 lb. |
| Load-limit capacity .... | 122,700 lb. | 126,350 lb. | 125,650 lb. | +3,650 lb. | +2,950 lb. |
| Cubic capacity | 3,045 ft. | 3,045 ft. | 3,311 ft. | Same | + 266 ft. |

(b) Request the full co-operation and assistance of the builders in the design work through the Committee on Car Design of the American Railway Car Institute.

(c) Review the design each year and make revisions as may be considered necessary or desirable so as to keep it currently up to date and representative of the latest state of the art.

(d) Design the car body so as to provide satisfactory applications of the principal proprietary specialties for a car of this type; i.e., doors, ends and roofs. At the same time, make proper provisions for designs of these items to be prepared by the builders. In the event development of satisfactory applications for both constructions to the same basic car structure is found to be impracticable, then changes in the structure necessary to accommodate either one group or the other are to be made in order to accomplish this result.

(e) All A.R.A. member roads are to be licensed by the car builders to use, without royalty, any of the constructions or details incorporated in the design by the builders, on which they now may hold patents, have patents pending or for which later they may file applications.

(f) Take advantage of available information relating to maintenance and service of existing cars of this general type.

## Calculated Stresses

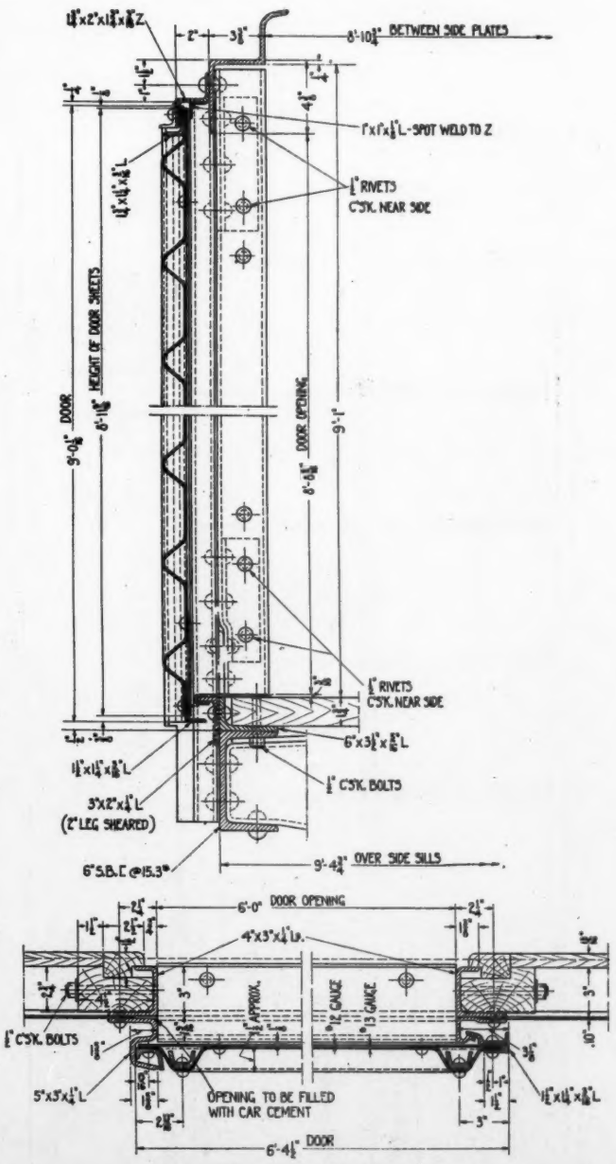
In its report the committee referred to the specifications for fundamental calculations for the design of box cars last published in Circular D.V.-640, May 25, 1929, which calls for the following maximum stresses per square inch:

| | |
|---|---|
| Center sills..... | 16,000 lb. |
| Bolster and cross-bearer cover plates..... | 12,000 lb. |
| Side truss members..... | 20,000 lb. |
| (This refers specifically to the steel-frame side construction, but was listed for reference) | |
| Rivets | |
| Shear ..... | 10,000 lb. |
| Bearing ..... | 20,000 lb. |

Maximum stresses in the principal underframe and superstructure members as computed in accordance with the specification for both the previous car and the new design are shown in Table II. The minus sign indicates tension and the plus sign, compression.

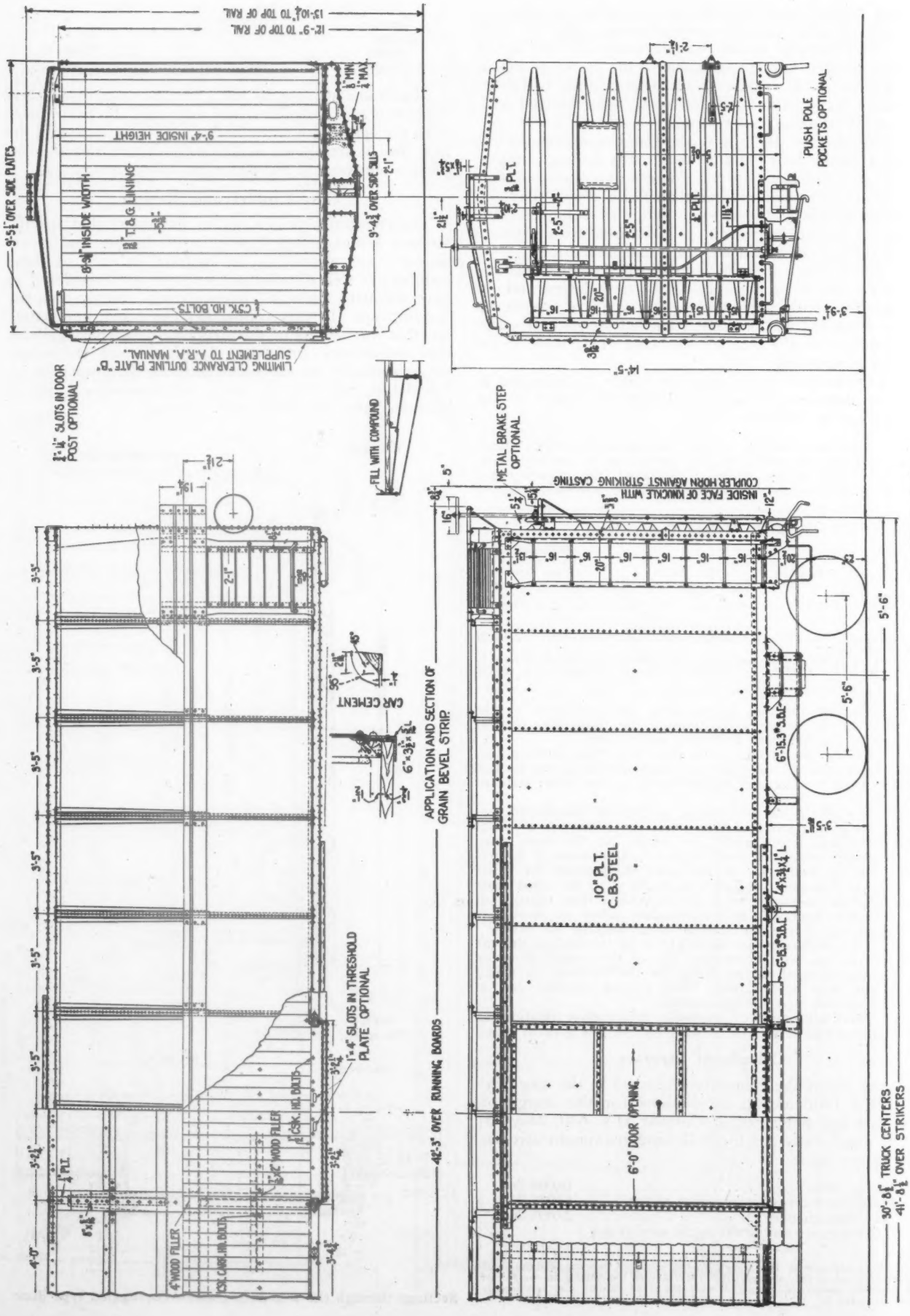
## The Underframe Design

The committee points out in its report that specific stresses are exceeded slightly in the bolster and cross-bearer cover plates, but the material in each of these members is well distributed and both are considered to have adequate strength. Rivet stresses comply with the specification. In this connection the committee points out that the success of the structure depends largely on the connections and the magnitudes of secondary stresses usually not subject to accurate determination by calculation, and that too much emphasis should not be placed on the calculated truck stresses.




**Sections through the side-door frame—Corrugated type door**

* In the reference to the report on the proposed box-car design which appeared on page 281 of the July, 1932, issue, the saving in weight of the proposed design as compared with the 1923 design was erroneously stated as 2,340 lb.




The car with doors, ends and roofs of builder's design

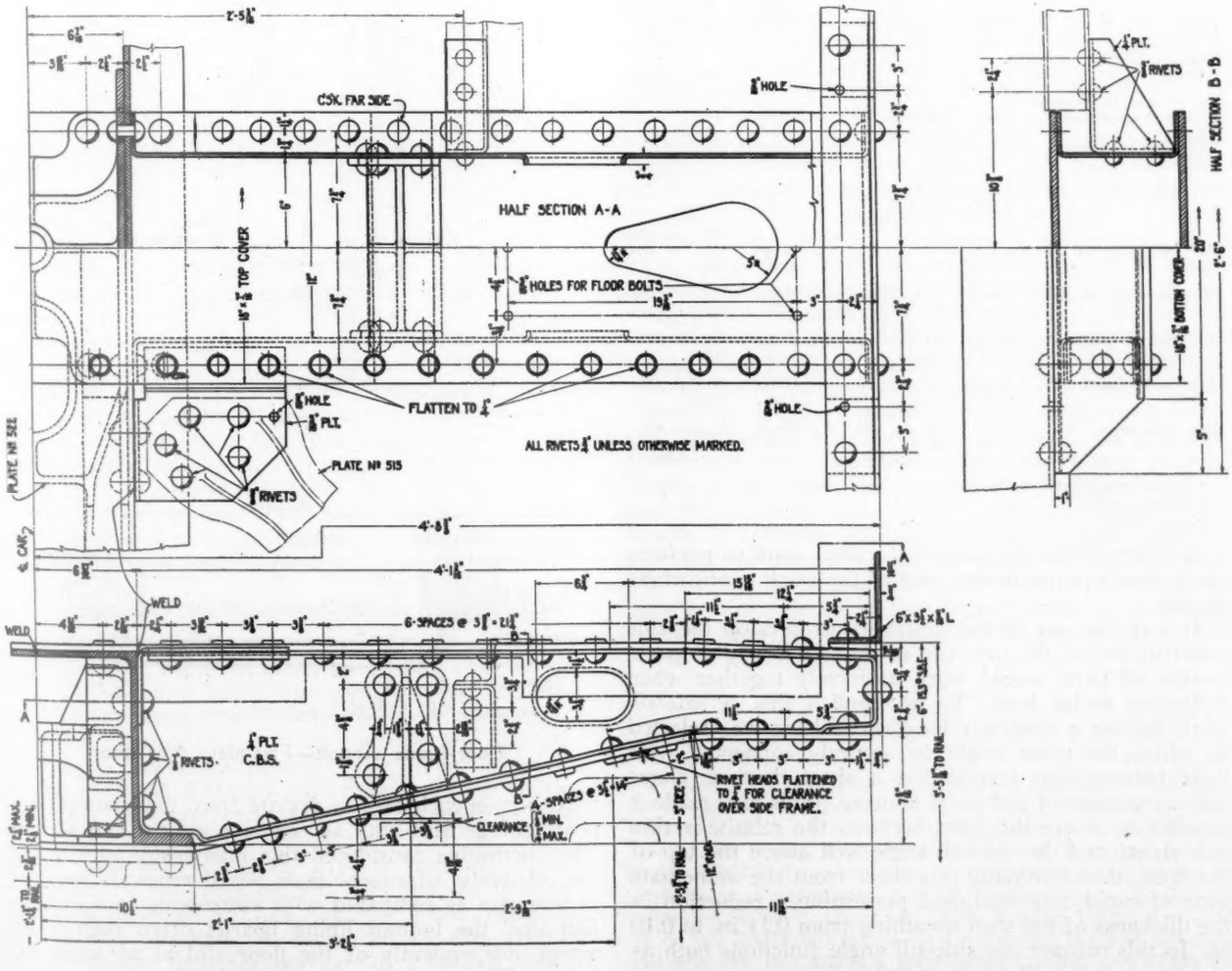
In two important respects the new design departs from existing fundamentals and recommended practice of the Mechanical Division. These are a reduction of 1 in. in center-plate height and a complete change in the center-sill section.

Reducing the center-plate height to 25¾ in., which is 1 in. less than the present standard A.R.A. height, permitted the development of a design in which the center line of draft is only slightly below the neutral axis of the center-sill section. The secondary stresses of buffing are thus practically eliminated and the combined stresses in the sill section are considerably reduced. For 40- and 50-ton trucks ample rail clearances are provided even when using multiple-wear rolled-steel wheels turned down to the minimum permissible rim thickness.

The center-sill section most generally used at present consists of two rolled members with a riveted top cover plate. In order to obtain a more uniform resistance to shocks a member which is practically a single unit has been formed by the use of two rolled Z-bars having the inner edges of the top horizontal flanges joined together by a welded seam. The seam, which may consist of a light continuous weld or a series of short welds, is provided so as to enable the two center-sill members properly to resist lateral deflection when under buff. This construction, being in the form of an inverted flanged U, provides a smooth interior surface for the application of the bolster-center filler, draft gear and striker and for the cross-tie fillers. The center line of draft is 6⅛ in. above the bottom edge of the sill and .309 in. below the neutral axis of the section. Because of the small eccentric arm and the substantial unit construction, the sectional area of 21.08 sq. in. is expected to give service at least equal to a much larger built-up section in which the material is differently disposed. The present standard of the association calls for a minimum section area of 28 sq. in.

The center-sill construction permits the application of an efficient design of combined bolster center filler, rear draft-gear stop and center-plate reinforcement. All bearing surfaces against the sill and bolster cover plate are machined. A direct bearing is provided between the under side of the top sill flanges and the casting, thus eliminating all live-load shear from the rivets and protecting the body center-plate flanges against failure from distortion. The filler casting has been extended beyond the bolster toward the center of the car, thus effecting a reduction in the stresses from eccentrically applied shocks, transmitted through the draft gear, in the sill back of the bolster. All rivets have been carefully located to make them easily accessible and to assure tightness when driven.

The two cross-bearers have been located in line with the door posts and two additional cross-ties have been placed across the car between the bolster and cross-bearer at each end. An intermediate stringer of Z-bar section has been located midway between the side sill and the center sills extending longitudinally between the




The bolster construction showing a cross-section of the center and side sills

bolsters, cross-ties and cross-bearers. This support for the floor structure, which was not provided in the previous design, has permitted the use of 1¾-in. pine flooring instead of the 2¼-in. material specified in the previous design.

### The Superstructure

In numerous previous box-car designs, including the 1923 recommended-practice design, the side sill consists of a heavy channel located below the floor line. Usually the side posts have taken the form of a flanged U-pressing connected at the bottom to the top flange of the side-sill channel. With the side sheets extending below the bottom line of the floor, which rests on the top flange of the sill, a pocket is formed between the ends of the floor boards and the sheets where moisture collects and causes relatively rapid corrosion of the sheets. The attachment of the side posts to the sill is inefficient and in some cases it has been necessary to reduce the post section at the bottom and flange out the material to form the connection thereto, further weakening the structure at this point. It is also necessary to cut out and fit the floor boards around the posts, thus subjecting the posts to corrosion. Due to the relatively greater stiffness of the side channel as compared with the posts,

**Table II—Stress Comparisons in Important Members**

| | Previous design, Circular D.V.-286—Cross-bearer at door posts | | New design | |
|---|---|---|---|---|
| | Area of section | Max. stress at | Area of section | Max. stress at |
| Center sill | Gross 28.43 | Bolst. bot. + 13,360 | Gross 21.08 | Bolst. bot. + 15,750 |
| Bolster (Cover plates only) | Net 20.375 | Top — 9,611.6 | Net 14.32 | Top — 13,583 |
| Underframe cross-bearer (Cover plates only) | Net 7.18 | Bottom — 10,260 | Net 5.02 | Top + 12,742 |
| Underframe cross-tie | Gross 2.56 | | Gross 2.17 | Stringer, top and bot. + 9,550 |
| Side sill at door | Gross 5.48 | C.L. of door, bottom — 6,957* | Gross 6.12 | C.L. of door, bottom — 3,860* |
| "W" side plate at door | | | Gross 3.85 | "W" side plate C.L. of door, top + 5,678* |
| "Z" side plate at door | Gross 4.08 | C.L. of door, top + 8,870* | Gross 3.26 | C.L. of door, top + 6,445* |
| Side post | Gross 2.67 | At side sill, inside — 10,900† | Gross 1.72 | At side sill, inside — 13,160† |
| Door post, front | Gross 2.67 | At side sill, inside — 26,500† | Gross 3.09 | At side sill, inside — 13,870† |
| Door post, rear | Gross 2.30 | At side sill, inside — 35,200† | Gross 2.60 | At side sill, inside — 17,621† |

* Direct stress only.
† Bulging only.

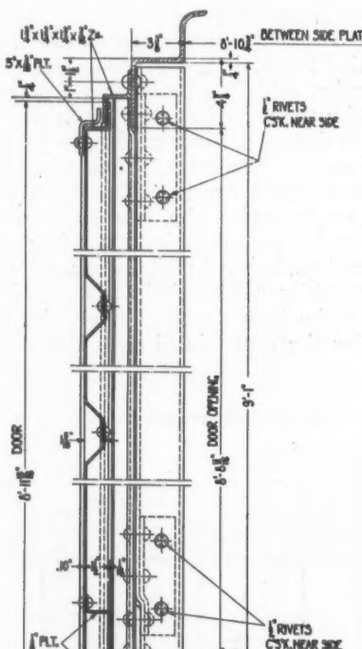
it is believed that the latter are called upon to perform more than a proportionate part of the work in absorbing shocks.

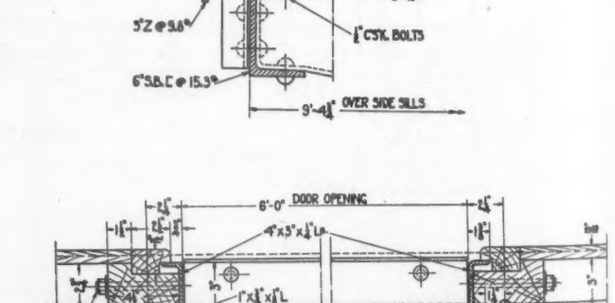
It was the aim of the designers to develop the side construction of the new car so that as nearly as practicable all parts would work uniformly together when deflecting under load. To accomplish this, a side-sill angle having a relatively long vertical leg was selected to which the posts might be securely connected with their bottom ends terminating a short distance above the top surface of the wood flooring. This also made it possible to locate the joint between the relatively thin side sheets and the side-sill angle well above the top of the floor, thus removing this sheet from the immediate zone of rapid corrosion, and permitting a reduction in the thickness of the steel sheathing from 0.11 in. to 0.10 in. In this manner the side-sill angle functions both as a strength and a closure member.

The horizontal flange is of sufficient length to provide adequate support and means of securing the flooring and the boards are not cut out at the posts. Effective and convenient application of grain strips may be made on top of the floor and between the posts.

In order to avoid damage to certain classes of lading, it is now the general practice to extend the side lining down to 1½ in. of the floor and to round off the inside corner of the bottom boards. This has been done in the new design and it is consequently necessary, when replacing floor boards, to remove the adjacent bottom lining boards.

A number of studies were made in efforts to eliminate the latter operation, but to accomplish this it was found




**Door-frame section—Flat-plate type door**

necessary in each case to deviate from the basic sill and post arrangement with an increase in cost and weight. The committee considered this inadvisable in view of the relatively infrequent floor board renewals required in box cars as compared with automobile cars and the fact that the bottom lining boards often require renewal independently of the floor and at no great expense. The committee, however, is giving this matter

further study with a view to finding a means to permit individual floor board renewals without disturbing the lining with the proposed basic sill and post arrangement.

The side plate is a modified form of Z-bar, known as the W-section, formed by curving the upwardly extending leg inward to provide additional support for the roof structure where it curves down at the eaves. An alternate design using the customary Z-section has also been provided. The side posts and door header are rolled steel Z-sections and the door posts are formed of rolled steel angles with the inwardly projecting flange pressed into channel form.

### Ends, Roofs and Doors

One of the general drawings shows the car equipped with the latest designs of proprietary ends, roofs and doors, while the other shows the car equipped with ends, roofs and doors of builders' design. Both designs are completely interchangeable so far as ends and roofs are concerned and require no change in the basic structure of the car body in the case of doors. The outside door frames, however, differ for the two types. Horizontal and vertical sections, showing the construction for both types of doors, are included in the drawings.

In the case of the proprietary corrugated end, the top half is $\frac{3}{16}$ in. thick and the bottom half ¼ in. thick, while in the end designed by the builders the upper two-thirds is $\frac{3}{16}$ in. thick and the bottom one-third ¼ in. thick. The builders' end is approximately 71 lb. per car lighter than the proprietary end.

Only the rigid form of roof is shown in the drawings, but the superstructure design is such that any form of flexible roof may be applied, if desired, without change in the base structure. The proprietary roof shown is the latest design of panelled solid-steel roof in which no vertical rivets are used and the carlines are located outside the roof sheets. Galvanized copper-bearing steel is used for resistance to corrosion. In the rigid riveted steel roof designed by the builders the roof sheets are supported on inverted flanged U-type carlines, eleven in number, thus eliminating the closed box section previously used and the possibility of moisture retention within the carline. The committee also expresses the belief that the reduction in the number of rivets for securing the roof sheets to the carlines and the use of roofing paper between the laps of the sheets should considerably reduce potential leakage troubles. Plain copper-bearing steel sheets are specified for resistance to corrosion.

Provision can readily be made for the attachment of insulation to prevent condensation on the under side of the roof sheets when desired by the purchaser.

### Advantages of Standard Inside Dimensions

In presenting the new design the committee presented data to show the effect on the first cost of variations in the inside height of cars otherwise conforming to the basic design, from information prepared by the builder's committee. For an increase of 2½ in. in height, the increases in price vary from 3 per cent on an order of 300 cars to 0.5 per cent on an order of 2,500 cars, and for a 10 in. increase in height from 4.3 per cent for 300 cars to 1.9 per cent for 2,500 cars. For example, with an increase of 5 in. in height on an order of 500 cars and the base price assumed to be $1,850 per car, the direct increase in cost to the purchaser is calculated by the committee to be not less than $37 per car, or a total of $18,500 for the lot.

Other reasons set forth by the committee why non-standard cars cost the railroads more than standard cars are delays in production caused by changing from one design to another during the operation of the builder's plant, delays in getting the material on hand, difficulty in satisfying the shipper where he may choose from a variety of sizes, and added repair cost incurred by the railroads on account of having to carry different materials in stock.

### The Trend of Future Developments

The new design has been developed to provide adequate strength and dependability for general interchange service and is intended for bulk loadings which the committee believes will continue to be of great importance to the railroads.

In discussing the trend of future developments, the committee made the following statement: "Although no alloy steels or integrally welded constructions have been used, except for the welded center-sill seam * * * we believe that in the not far distant future both of these deviations from present general construction practice may be expected to provide further practical means of reducing weight. Certain railroads are now making studies relating to steels having improved strength characteristics and further developments along this line may result in material reductions in casting weights, such as bolsters, side frames, center fillers, strikers and draft-gear stops without decrease in present strength requirements.

"At this time no changes in truck materials or conventional design standards are proposed for the new design. Any type of either 40- or 50-ton nominal capacity may be used with the same body provided the general truck conditions are met. These consist of center-plate height, wheel base and clearances as illustrated * * *, also, material and strength requirements in accordance with present A.R.A. specifications.

"The anticipated life and durability of a freight car depends not so much upon the use to which it is put as upon the abuse to which it is subjected. If it were not necessary to design cars to withstand severe punishment, much lighter equipment could be built and successfully operated. As time goes on, it is believed that improvements may be expected in cushioning devices, more resilient and flexible truck combinations, standards of running-gear maintenance, yard operations, train handling and braking practices and through co-operation of all concerned, including the shippers, traffic and operating department officers and maintenance organizations, the designer may be placed in position to go much farther than is now considered practicable in reducing equipment weights. It is conceivable that further reductions in weight might be accomplished in the future through the development of smaller units designed for either freight or passenger service, some of which might take the form of sectional container cars."

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A RESULT OF THE HEAVIER-LOADING CAMPAIGN?—According to an official of the Chamberlain Bean Company of Port Huron, Mich., a carload of split peas recently delivered in Boston by the Boston & Maine contained sufficient split peas to make 2,500,000 bowls of soup, a quantity sufficient of fill 25 tank cars. Furthermore, the 125,000 lb. of peas in the car contained 30,750 lb. of protein, 77,700 lb. of carbohydrates, 1,250 lb. of fat, 201,000,000 calories and 8 different kinds of minerals. All together, this makes a pretty good carload, one which the Car Service Division may want to hold up as a model.

# EDITORIALS

## Material Failures Reduced

In spite of greatly curtailed expenditures for equipment maintenance, generally speaking, failures of the parts of cars and locomotives still maintained in service have been surprisingly few. As already pointed out in these columns, the annual report of A. G. Pack, chief of the Bureau of Locomotive Inspection, shows only 10,277 locomotives found defective in 1931 out of 101,224 inspected, whereas 16,300 locomotives, out of practically the same number inspected, were found defective in 1930. In other words, only about 63 per cent as many locomotives were found defective by the Bureau's inspectors in 1931 as in 1930. The conclusion is unavoidable that, considering the handicaps of railway mechanical and inspection forces at the present time, unusually good results are being secured in the maintenance of locomotives in condition for safe and economical operation.

Another indication of the accuracy of this conclusion may be found in the generally increased mileage between engine failures, hot boxes, etc., being reported on a number of roads. In many instances the mileage per engine failure and the mileage per freight car hot box have been nearly doubled in the past two years. On one large system the number of derailments and delays caused by the failure of locomotive material decreased over 65 per cent in 1931 compared with 1930, these failures being caused largely by defective driving and truck axles. In car-material failures, the decrease was over 40 per cent in 1931 as compared with 1930. About 29 per cent of these train delays on account of defective car materials were due to the failure of arch-bar trucks and 27 per cent were due to the failure of burned-off journals. A careful check of the figures indicates that this reduction in material failures has not been due entirely to reduced traffic, there being only about 60 per cent as many failures in 1931 as in 1930, when expressed on a locomotive and car-mileage basis.

## Modern Facilities A Big Help Now

It has been a part of the policy of many railroad mechanical officers for years in the past to consider the engine terminal the logical place for the installation of machine tools that have seen better days in the back shop. They have justified this policy by the contention that the relatively small amount of machine work did not justify the expenditure for new and better machines in the enginehouse machine shop. Within the past five years, however there have been some mechanical men who were far-sighted enough to realize that an obsolete or half worn out machine had no more right in the enginehouse than it had in the back shop and, in spite of some skepticism, insisted on equipping the terminal machine shops with modern machines.

Two factors have entered this situation during the depression that have made it worth while to give some thought to engine terminal facilities—the greater load that the engine terminal has been called on to carry with the back shop shut down so much of the time and the necessity of operating the terminal at minimum costs in order not to run up the average cost of turning power in view of the greatly reduced traffic on the road. Where an enginehouse is equipped with up-to-date tools it has been found that it is practically a self-contained unit as far as the lighter machine work is concerned and that it is possible to perform a large part of the lighter classified repair jobs that many terminals are now doing without the necessity of calling on the back shop machine forces with the resultant delays due to curtailed operations in the back shop. With so much of the power out of service either on the storage track or awaiting repairs it is more important than ever that the repair work on the power that is in service be handled with as little delay as possible. Where far-sightedness in the past has resulted in modern equipment in enginehouses conditions such as we are operating under today seem to justify the judgment of the mechanical men who worked on the basis that an engine terminal is entitled to nothing less than the best. If modern facilities will pay returns on today's business, a change in the policy of the many who were skeptical ought to be well worth while for the future.

## Modern Equipment For Babbitting

In view of the large amount of babbitting in the average railroad shop, there can be little question that the use of more modern equipment and a more carefully developed program of procedure than is generally used with this class of work will show large returns on the investment. In addition, it may be said that proper attention to the arrangement of equipment for detail operations will at the same time affect a marked improvement in the babbitt shop from the point of view of neatness and cleanliness and contribute to the safety of workmen employed there.

In certain babbitt shops which specialize on the relining of car brasses a large volume of repetitive work is handled, and it is particularly important that the latest improved types of babbitting fixtures, as well as babbitt-melting and handling equipment, be arranged to eliminate loss motion and minimize manual handling. It is a compulsory requirement of the American Railway Association interchange rules that car brasses be bored before tinning and relining, and most roads are following the optional practice of boring or broaching the relined brasses to give a uniform bearing on the journal, remove surface irregularities and show up any imperfections in the lining.

In addition to car brasses, a large volume of babbitting work is done on most roads in relining crosshead shoes, valve crossheads, engine trucks and trailer brasses, and, in some cases, driving box side-bearing plates. The familiar procedure of melting out the old babbitt, careful tinning with acid and a steel brush, and applying new babbitt by means of suitable molds and babbitting fixtures can, in numerous instances, be studied and reorganized on a more efficient basis.

In recent years, the use of electrically heated furnaces

and melting pots has been considerably extended, presenting the combined advantage of effective automatic temperature control and an unusual degree of cleanliness in the babbitt shop. The Canadian National, for example, has recently installed an electric furnace and electric melting pots with automatic controls in the babbitting department at Stratford, Ont., shops. The furnace for the melting off of old babbitt is maintained at approximately 850 deg. F., the melted babbitt flowing from the furnace floor through a chute into a container from which it is removed and subsequently recast. A total of three melting pots are available for regular and special jobs of babbitting, the babbitt baths being held at a temperature of about 1,050 deg. F.

The necessity of great care in burning off or otherwise removing all dirt and oil from the parts to be rebabbitted and careful tinning to assure a firm adherence of the babbitt and seal can hardly be overemphasized. Proper control of the babbitt mixture, to secure the desired physical and chemical properties, is also important and the capacity and type of heating equipment selected has a vital bearing on costs.

## The Composite Versus The All-Steel Car

Any discussion of the economic life of a freight car involves a variety of related details. When the all-steel freight car was first introduced back in the 1890's, there were stalwart supporters of the all-wood type of construction and the argument continued for many years. The principal objection to the all-steel type of construction on the part of those who advocated wood was that corrosion would weaken an all-steel car faster than a car built of wood.

It was generally admitted that corrosion was an important factor in determining the life of an all-steel car. For that reason the period from 1900 up to the present time has been one during which extensive efforts have been made to develop a corrosion-resisting steel alloy that could be used in freight-car construction. Copper-bearing steel is one of the results of these efforts.

Nearly forty years' experience with cars of all-steel construction has shown that corrosion has taken its greatest toll from the floor and side sheets. As a general rule, the original underframes have lasted the life of the car through all major repairs except, of course, when damaged by accident. The record of repairs made to one of the first all-steel hopper cars constructed in this country shows all of the repairs were made to the body structure because of corrosion and damage by unloading machinery. At no time during the thirty-one years' life of this car, a Bessemer & Lake Erie car built in 1896, were copper-bearing sheets applied, nor was it necessary to strengthen the center-sill construction. The original center sills were of 15-in. I-beam which stood up well in service.

A recent check made by the car department of an eastern railroad showed that a series of all-steel hopper cars built in 1919 had lost 2,200 lb. light weight because of corrosion. The original light weight of one of this series of cars was 40,800 lb. By 1932 the light weight had been reduced to 38,600 lb. No additions or betterments had been made to this series of cars which would affect the light weight. Inspection of the cars showed that the loss of 2,200 lb. was due to corrosion of the side and floor sheets. The renewal of the hopper slope sheets with new material restored the light weight of one of these cars to 39,000 lb.

There are roads which handle a large business in certain commodities, such as coal, ore, etc., on which the maintenance of the all-steel car has been costly. A number of these roads have favored the composite car, both hopper and gondola, for many years. The composite type of construction has stood up well in service.

The majority of repairs to all-steel cars are made to the body and not to the underframe. Even those roads which make a practice of tearing down all cars in each major shopping leave the underframe intact. The rebuilding process as conducted in the average railroad car shop consists of rebuilding the body or superstructure. Copper-bearing steel has been tried and, with many commodities, has been found wanting. Other materials have been developed, but the cost per pound has been prohibitive. Until some material has been developed which will economically combat corrosion, the composite car will continue to be an important feature in rail transportation.

## Midsummer Madness

July and August weather—hot and humid—sometimes has a surprising effect upon the thinking and attitude of even the most level-headed citizens. "Dog days" and "midsummer madness"—these are expressions frequently heard at this time of year. Possibly, therefore, we ought not to take too seriously the fact that Mechanical Engineering, the official organ of the American Society of Mechanical Engineers, plays up as the first feature article in its August number, an article by Leon Cammen on "The Transportation Dilemma", in which a solution of the railway problem in this country is suggested that borders on the fantastic. Apparently the writer has little knowledge of the economics of transportation.

In substance Mr. Cammen suggests that the railroads continue to use the present tracks for handling freight, and local or accommodation passenger traffic. An overhead structure will carry on its underside a suspended railway for high-speed passenger traffic, the trains being operated at an average of 125 miles an hour. The upper surface of the elevated structure will be used by motor vehicles with two traffic lanes in each direction, one for slow vehicles operating under 45 miles an hour and the other for fast vehicles with a permissible top speed of 70 miles an hour. The motor vehicles will pay toll to the railroads for the use of the highway. Mr. Cammen suggests that this arrangement be used for the entire length of the major railroad systems east of the Mississippi river, and indicates that it might require the expenditure of a billion dollars a year over a period of from six to ten years.

What would the railways gain by this arrangement? It is suggested that the freight service operation could be speeded up, but the railways have been steadily improving in this respect in recent years and the limit has not been reached with the present facilities, by any means. The adoption of storedoor pick-up and delivery promises to expedite the handling of certain classes of freight traffic and will undoubtedly greatly improve the position of the railroads in dealing with their competitors. There seems to be little question, also, but that this may mark the first step in bringing about the use of special freight handling equipment, which will make it possible to reduce the cost of

handling. Quite possibly, also, through the use of special containers, it will simplify the problem of packing and crating and considerably reduce loss and damage. The common ownership of freight equipment, which is not an impossibility, will not increase the capital investment—indeed, may decrease it—and will undoubtedly greatly increase the capacity of the present plant by eliminating useless movements.

The overhead construction suggested by Mr. Cammen will greatly increase the cost of the plant. Can this be justified on a business basis? The motor truck traffic will pay tolls, but the service will parallel that of the railways, which are already paralleled by public highways which the motor vehicles can use without extra charge. What is needed, if we are to co-ordinate our transportation agencies, is not a paralleling of the railways with super-highways, but rather the building of better located highways which will feed the traffic to the railroads. A scientific study should be made of the transportation needs of the entire nation and then plans should be made to meet these needs with the best service at the lowest cost to the public as a whole. Just now the situation is very much unbalanced because the railroads, the backbone of our transportation system, are over-regulated and overtaxed, while the other carriers, except in a few instances, are subjected to comparatively little regulation or taxation. The situation has become so desperate that the railroads are having to fight for their very lives. Fortunately the public has awakened to this situation and steps have already been taken in some states, and will be taken in many others during the coming year, to place these various types of transportation on a more fair and equitable basis. About the last thing that is needed now, or in the days to come, are super-highways paralleling the railways.

What about the high-speed passenger traffic with the suspended railway? True, as Mr. Cammen says, this is not an entirely new idea, because there are suspended railways abroad, but can the American public afford to pay for this high-speed service? The railways have lost much passenger traffic, most of it, however, to the private automobile. The long haul buses will carry much less traffic than they now do when they are subjected to adequate regulation and taxation. Could the railways not profit far more by making passenger travel more comfortable and convenient, rather than by making radical increases in the speed? Many people will desert the bus and private automobile when they can ride comfortably in an air-conditioned train, with no dirt and little noise. Certainly, if the suspended rail car is to be used to operate at average speeds as high as 125 miles an hour, an increase will have to be made in the passenger fares which will be beyond the means of the average traveler, and he will be forced to go to the airplane or the highway.

Apparently the editor of Mechanical Engineering was a bit skeptical, for after taking a full page to introduce Mr. Cammen's article, he closes with this suggestion: "Mr. Cammen merely brings them (different types of transportation) together in a scheme that will not require purchasing a right-of-way, because it already exists, and in such a manner that the railroads can benefit. It is something to ponder over. Maybe you can think of a better scheme."

The various forms of transportation must be co-ordinated in the public interest. Radical changes undoubtedly will be made. The problem is, how can we provide the best possible transportation at a price which the American people can afford to pay? This is no simple problem. We do know, however, that there are vast possibilities, based on logical premises, which will adequately supply our needs for many years to come, with capital expenditures that are much more reasonable than would be required by Mr. Cammen's proposal.

## NEW BOOKS

ARTICULATED LOCOMOTIVES. *By Lionel Wiener, professor at the University of Brussels. Published by Richard R. Smith, Inc., New York. 628 pages, 5½ in by 9 in. Bound in cloth. Price, $10.*

While this is the first American edition of this book, the entire subject has been reworked and two-thirds of the material is new. An effort has been made to establish a clear system of classification of the numerous articulated type locomotives described; information is given concerning a number of obsolete types; references are given to many locomotives of each type, and tables of principal dimensions are given for various articulated locomotives, both metrical measurements and British equivalents being used in a number of cases. The volume is divided into four books: Book I, Articulated Locomotives Properly So Called; Book II, Semi-Articulated Locomotives; Book III, Temporarily Articulated Locomotives or Locomotives with Auxiliary Engines, and Book IV, Utilization of the Tender's Weight for Propulsion.

SYMPOSIUM ON MALLEABLE IRON CASTINGS.—*Published jointly by the American Society for Testing Materials, 1315 Spruce street, Philadelphia, Pa., and the American Foundrymen's Association, 222 West Adams street, Chicago. 132 pages, 6 in. by 9 in., paper bound. Price, 75 cents.*

The papers and data published in this book were presented at a symposium sponsored jointly by the American Foundrymen's Association and the American Society for Testing Materials and held during a session of the 1931 annual meeting of the A.S.T.M. The purpose of the symposium was to provide the engineering profession with authoritative data in concise form on the properties of malleable iron and castings poured from this metal and produced by the best present methods. The book contains the thought and practical ideas for many dealers in the malleable iron industry, many of whom, with their companies, contributed data and information for inclusion. After an introduction which defines the material covered and points out the major points in the symposium, there is an extensive section which treats of the manufacture of malleable iron castings. Next, the available data on the properties of malleable iron are presented and there are sections devoted to supplementary data, discussions of tensile properties, higher-strength malleable iron, cupola malleable iron, and the necessity of co-operation between the engineer-designer and the foundry, and a statistical analysis of the tensile test data prepared by Dr. W. A. Shewhart of the Bell Telephone Laboratories. A resume of current specifications for malleable-iron castings is given, and an extensive paper by O. W. Boston, professor, College of Engineering, University of Michigan, deals with an investigation of metals to determine the machineability of malleable iron castings. "Corrosion of Malleable Iron" is the title of another paper by F. L. Wolf, chief engineer and technical superintendent, and L. A. Meisse, research metallurgist, Ohio Brass Company. The oral and written discussions given during the session are included in the book.

# THE READER'S PAGE

## Can a Penny Stop a Locomotive?

To the Editor:

On page 237 of the June issue of the *Railway Mechanical Engineer* a reader asks how about Ripley's "Believe It or Not." A penny or other similar object in front of each driving wheel will not prevent the locomotive moving under its own power.

Ripley's explanation does not take into consideration the relative distance through which the tractive force acts as compared with the height the locomotive is lifted. The tractive force of a locomotive is from 20 per cent to 25 per cent of the weight on the drivers. Assuming 20 per cent, then so long as the distance through which the tractive force acts is more than five times the height the locomotive is to be lifted, the locomotive will move. Internal friction is disregarded. Also the rail and object in front of the wheels are to be in such condition that the wheels will not slip.

Between 22 and 23 deg. is the angle through which any size of driving wheel will rotate before the horizontal distance traveled will be less than five times the height the weight is to be lifted.

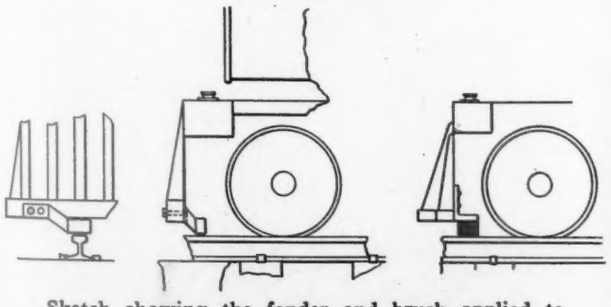
Under these conditions, theoretically, a locomotive with 57-in. driving wheels should lift itself on blocks 2 in. thick, and, if with 70-in. drivers, on blocks 2½ in. thick placed ahead of each driving wheel.

A Reader.

## Removing Obstructions From the Rail

To the Editor:

I have noted from accounts in the newspapers and other publications that many railway accidents have been caused by children placing nuts, spikes and other pieces of iron on the rail. Derailments are also sometimes caused by stones falling down embankments.



**Sketch showing the fender and brush applied to the pilot of a locomotive**

The brush arrangement shown in the drawing has been applied to the locomotives used by a western railroad which operates through canyon districts. It consists of a metal guard or fender of steel, ¼ in. thick by 3 in. wide and a brush, which is adjusted back of the pilot, to just clear the rail as shown in the sketch. The brush is made of strips of canvas. This device has been used successfully to keep the rails free of pebbles and small stones.

F. Rattek.

## A Boost for Mr. Drennan

To the Editor:

After reading the article in your June issue on Vocational Education, by Edwin G. Jones, it is necessary that I write you and express my opinion as well as the opinion of others about me with whom I have talked about this matter.

I have been reading the *Railway Mechanical Engineer* for the past seven or eight years and I enjoy and profit by it, but this article has rubbed the hair the wrong way, for Mr. Jones doesn't believe in Mr. Drennan's methods and chalk talks.

I wonder if Mr. Jones has ever visited Mr. Drennan's school and observed how he handles his instructions and puts them on and the interest there has been and is shown in his classes and methods. If not, he has missed something, for even without charts he can handle the chalk in a way that will explain the mechanism as well and as plain as any chart that I have seen yet, and I have been in the air-brake game for quite a number of years and am an air-brake specialist at the present time. Also, I have failed to find any man, so far, who has attended his classes who condemns them, but I have heard many good reports and much praise for him and his methods.

Some of the best air-brake supervisors in this part of the country, in fact, in my opinion, some of the best supervisors in the United States, speak very highly of him and his work and have invited him to visit other points outside of his state to lecture and explain his work.

The voluntary attendance at his classes has been very good for he has had better attendance than there has been at the air-brake instruction cars of some of the railroads where attendance is usually compulsory.

Many an engineman has called it a blessing to attend his classes, for it has helped them to pass their examinations when otherwise it would have been difficult to them to find the proper information and to understand their own books.

Not only does Mr. Drennan lecture, but he demonstrates all his talks with a blackboard and chalk and explains all points in detail, also taking in all defects and their causes. As for Unit No. 8, as Mr. Jones mentions, it is placed very clearly upon the blackboard and is understood as clearly by the carmen at the class as was their demonstration by charts on the air car, according to their own words.

I cannot see the reason for Mr. Jones's complaint on vocational education, for from what I have seen of it, it has accomplished lots of good.

Frank B. Connell.

PS.—I enjoyed your air-brake questions and answers very much, although I don't thoroughly agree with all of them, and some of us have enjoyed discussing them, so it won't hurt my feelings a bit and I know there are others who will agree with me, if you find some more of the same stuff, or similar air-brake material, and give us a little in the *Railway Mechanical Engineer*.

F. B. C.

# With the Car Foremen and Inspectors

## Reclamation of Brake Beams

EFFICIENT train operation is dependent in no small measure upon the efficiency of the braking power and to that end it is essential that brake beams be carefully constructed to withstand the severe service to which they are subjected. The American Railway Association has provided Standard Specifications and Tests for new beams which must be met by the manufacturers. The major parts of a complete brake-beam assembly consist of a compression member, tension member, strut, brake heads, brake shoe and brake-shoe keys. The shoes and keys are parts frequently renewed, an operation which is usually performed in transportation yards without difficulty. Still, when other parts fail it is necessary to remove the beam on the repair track and apply a new or reconditioned beam.

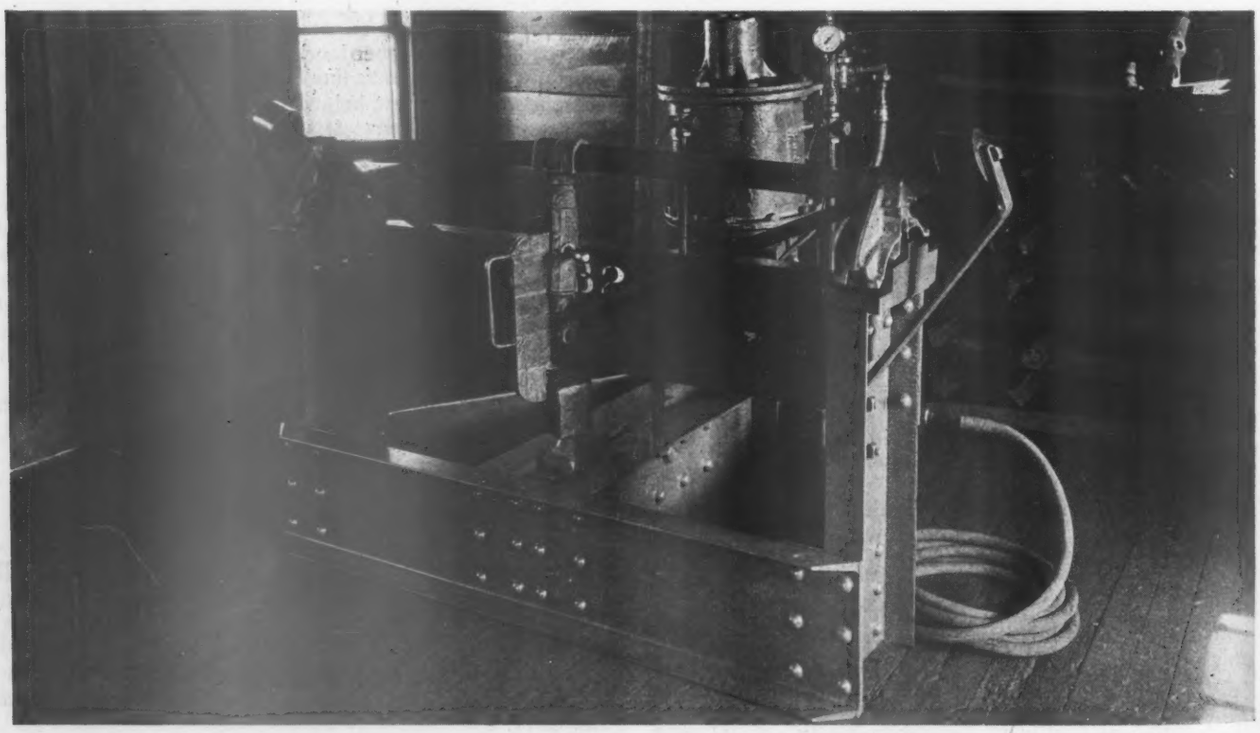
It is only reasonable to assume that in the application of reconditioned beams, assurance should be had that it be equally as strong as a new beam. Although the American Railway Association makes no provision in its specifications for second-hand brake beams, it is the intent of the rules nevertheless, that only serviceable beams of required strength shall be applied.

Years ago, and perhaps on some roads today, the crude practice of repairing beams by the simple wrench and hammer method was followed and the car owner billed for a serviceable second-hand beam without definite knowledge being had of its condition. In later years, however, the fallacy of this practice was generally recognized and many railroads entered into contracts with brake-beam manufacturers to have their accumulation of brake beams overhauled in a manner that would guarantee satisfactory service.

About two years ago the car department of the Delaware & Hudson undertook to make a study of the costs involved in handling, shipping and servicing expense of such work under contract. In the report it was recommended that consideration be given to the establishment of a central plant for overhauling beams by its own forces.

On May 1, 1931, a brake-beam repair plant was put in active operation at Oneonta, N. Y., with two men exclusively engaged in this occupation. Studies were continued and after certain changes were made it was found that one man could handle the entire output and provide sufficient beams to supply all points with their requirements without delay.

Until this plant was established it had been the practice to carry large supplies of brake beams at the three major division points whereas under the present arrangement the only source of supply is Oneonta and definite knowledge of requirements is therefore had. Undesirable beams such as the T-iron tension-member design are scrapped. In other words, the so-called "mongrels" are consigned to the scrap heap, only the more popular, commonly used beams being reclaimed for service. Consequently the variety of serviceable parts recovered is limited to standard stock items and as beams are promptly dismantled an adequate supply of repair material is always available, thus insuring a better



Machine for testing deflection and brake-shoe head mounting


**Machine used for dismantling and re-assembling brake beams**

balance of stock with result that unnecessary purchases of new parts are avoided.

Mindful of the fact that the function of a repaired beam is the same as that of a new beam, it may be of interest to give a brief description of the paths followed in reclaiming, repairing and testing of beams in the D. & H. plant.

1—All beams for reclamation are forwarded to Oneonta in the regular supply cars and unloaded on platforms at the plant.

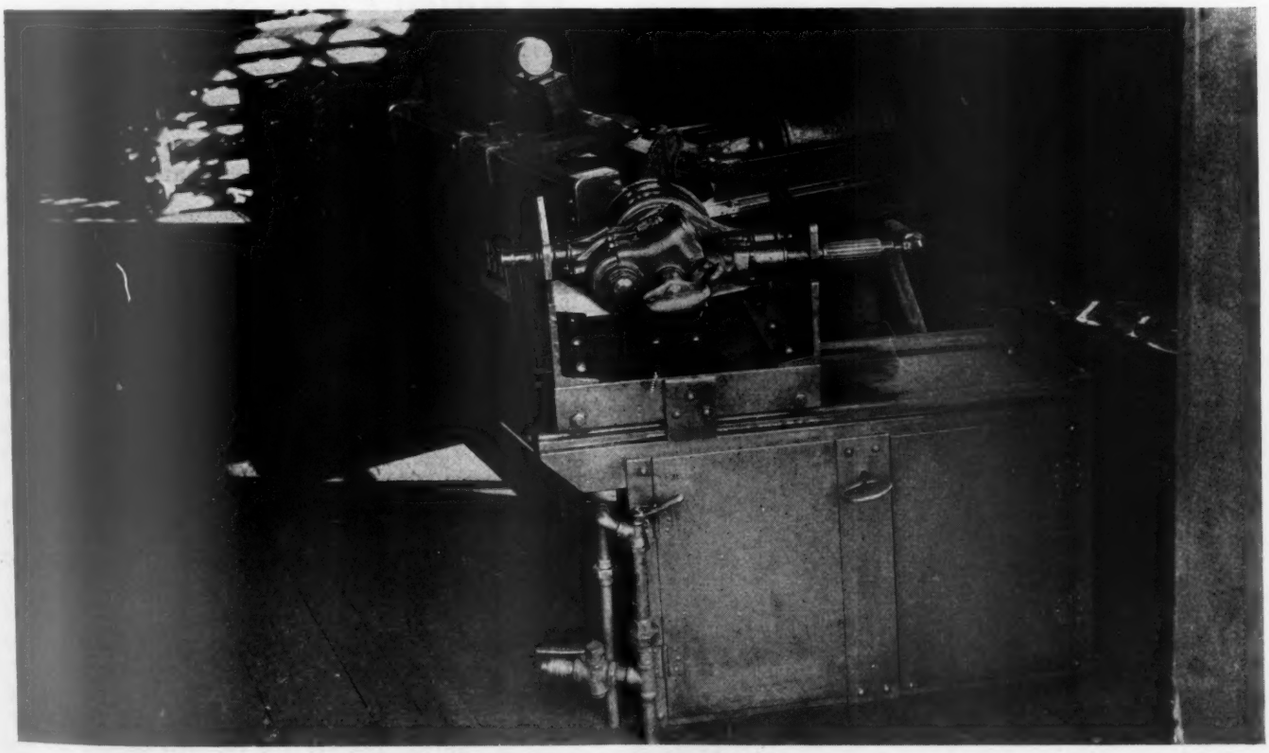
2—They are then sorted as to styles and the "mongrels" and badly damaged beams are scrapped.

3—Those remaining after this classification are completely dismantled to permit proper inspection of parts. All parts are gaged with standard A.R.A. gages and classified for rebuilding into No. 2, No. 2-plus, or No. 3 beams.

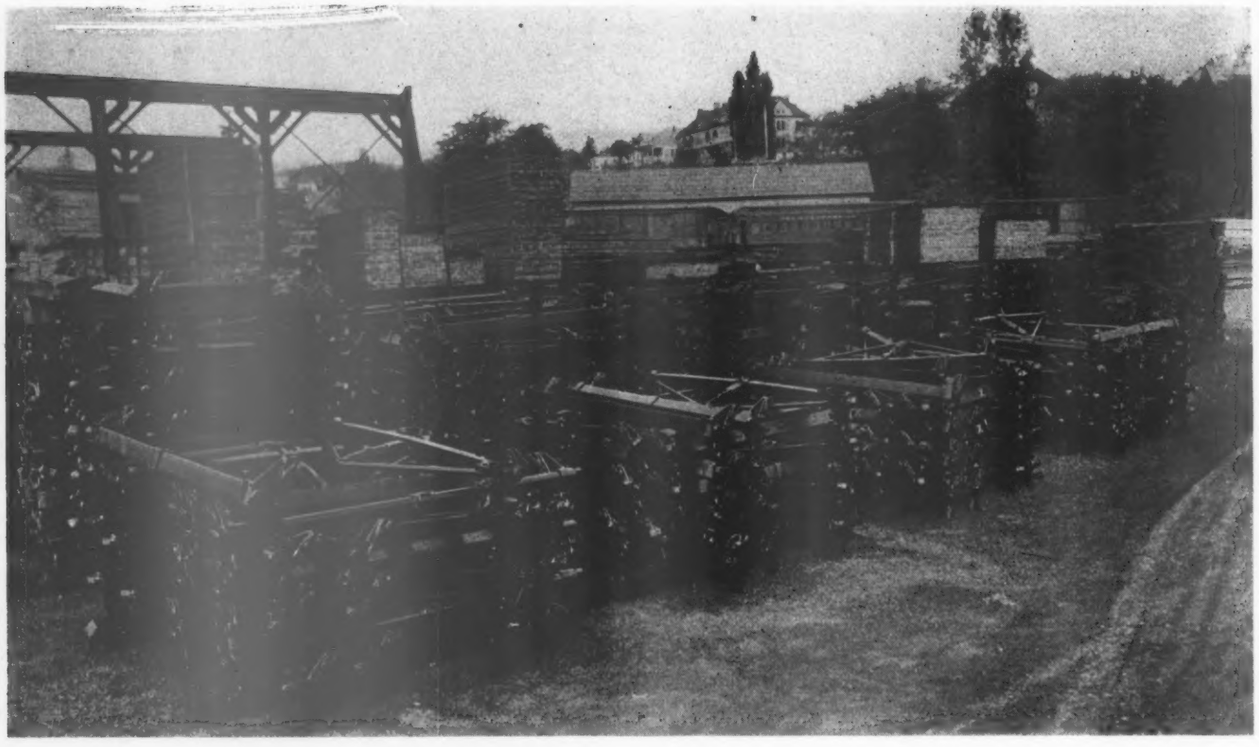
4—Beams are then dismantled and re-assembled on the same machine. This machine, which is shown in two of the illustrations, consists of a permanent table equipped to mechanically clamp the beams in place by means of air-operated clamps. The tension-member nuts are applied and removed by reversible motors mounted in such a manner as to permit easy movement in any direction. The machine is constructed to permit unobstructed removal of all parts. In assembling, the application of new parts is made simple. The device is so constructed as to insure proper distance from the center line of the heads to the fulcrum for the various types of beams. Central mounting of heads is also insured by means of an automatic air-operated gage.

Correct cambre of beam is provided by correctly located filler pieces on the mounting table.

After assembly each beam is given a deflection and



**End view of the machine for dismantling and assembling showing one of the reversible motors for tension-member nuts**



**Reclaimed brake beams ready for shipment**

sturdiness test on the testing machine which is designed to exert a pull of from 24,000-lb. to 27,000-lb. required by the A.R.A. This machine also checks squareness of the mounting of heads, thereby avoiding the possibility of twisted beams.

Tension members are shaped on another air cylinder operated machine which is also used to straighten compression members. Furthermore, the same machine serves as a bench for applying struts properly to the center of beams. Dies for holding the various designs of compression members are used.

After testing, the beams are painted and marked with an *X* to indicate they are repaired beams. This is done for A.R.A. billing purposes. The beams are then stacked ready for shipment to shops requisitioning them.


**Tension and compression members are shaped on this machine**

## Galvanized Sheets To which Paint Sticks

THE painting of newly galvanized sheet metal is usually a troublesome problem. Paint does not adhere well to a freshly galvanized surface. To eliminate paint spalling, it has sometimes been necessary to weather galvanized sheets through exposure to the elements. This expedient cannot be applied to many types of work. Another expedient has been to etch the surface artificially with acids. However, this not only represents additional expense, but sometimes the acids etch too deeply into the protective zinc coating.

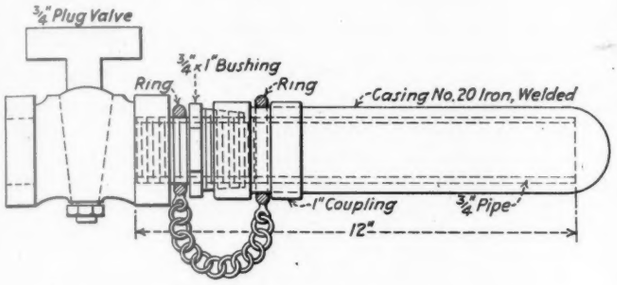
To eliminate these difficulties The American Rolling Mill Company, Middletown, Ohio, began research investigations several years ago with a view to developing a galvanized sheet which would combine the protective advantages of a uniform, full-weight zinc coating, with a fine textured surface which could be painted immediately after installation. The efforts succeeded, and the sheet has been named Paintgrip.

In mechanical pulling tests, it has been found that the bond between the galvanized surface and the first coat of paint is actually better than the bond between a first and second coat of paint.

Paintgrip is adapted for use in freight and passenger car roofs, as well as for other galvanized installations where appearance and protective qualities are desirable. The Paintgrip finish is supplied either on galvanized Armco ingot iron or Armco steel. Sales of this material in the railroad market are handled by the Armco Railroad Sales Company, Middletown, Ohio.

## Nozzle for Filling Water Coolers

SHOWN in the sketch is a sanitary nozzle for filling the water coolers and tanks on passenger cars which was designed by E. P. Hill, foreman, Central of Georgia shops, Savannah, Ga. The nozzle is made of a ¾-in. pipe which is screwed onto a nipple on the ¾-in plug valve. The pipe nozzle is threaded a sufficient distance on one end to take the bushing and valve. The 1-in. coupling is grooved for loose rings to which




**The casing over the nozzle protects it from dirt**

the chain is fastened to secure the casing to the nozzle. The chain is long enough to reach the end of the nozzle, so that the casing can be removed from the nozzle. The casing is welded to the coupling which screws over the nozzle to secure an air-tight joint.

By issuing instructions that the casing must be over the nozzle at all times when not in use will eliminate any possibility of dirt and other foreign matter clinging to the wet nozzle and thus getting into the drinking water on passenger cars.

## Decisions of Arbitration Cases

*(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)*

### Case Submitted To Clarify Rule 95

Illinois Oil Company car No. 313 was repaired by the Chicago, Burlington & Quincy on April 28, 1930, at Kansas City, Mo. Among other items, charges were made for coupler, coupler yoke and rivets missing, Bradford spring seats, broken and draft spring missing, all on the B end. A labor charge was made for the coupler, yoke and rivets, with a material charge for the yoke, yoke rivets, spring seats and draft spring. The car owner objected to the material charge for yoke rivets as being contrary to the provisions in the second paragraph of Rule 95, in that the draft gear was not "in place" due to the draft spring being missing. The Burlington contended that its charges was within the intent of Rule 95, as the missing draft spring was not a factor in determining whether the yoke could be missing, but still, presumably, intact. The Illinois Oil Company in its statement pointed out that Rule 95 permitted a charge for labor only when applying coupler yokes on account of being missing when lost with the coupler, except where the draft gear is in place. In this instance the entire draft gear was in place and, for that reason, this case was submitted to clarify this rule. The oil company stated that it would like to know if the entire gear must be in place, or just a portion of the gear. If a charge is permitted where any portion of the gear is in place, it stated, the rule will tend to confuse this matter further and that unless the entire gear is in place, the charge should be for labor only. It claimed that as conditions are the same now as they were before Rule 95 was changed, the interpretation of the rule increases car-repair bills without any compensating increase in the mileage earnings of privately owned cars. The oil company also asked the Arbitration Committee to reconsider case No. 1640, as many carriers were taking advantage of this decision to make a betterment charge when replacing missing couplers. All missing couplers, it contended, are missing along the line of the company repairing the car and eventually are picked up whether they are in good condition or broken. The car owner did not see why the betterment charge would be proper when the coupler is known to be in good condition any more than when the condition is unknown. The oil company expressed its belief that Arbitration Decision 1640 conflicted with Rule 95 and agreed with the Burlington that this conflict should be made clear by changing the rule or issuing an interpretation to cover the points of issue. The Burlington in its statement also gave as its reason for submitting this case a desire to clarify and define the exact intent of Rule 95. The second paragraph of this rule, it contended, does not indicate whether or not the entire gear is intended where the words "except where draft gear is in place" are used. If "gear" is intended to mean that each part of a gear must be in place before a missing yoke may be considered broken, it claimed, would not seem fair or logical in all cases. It was the understanding of the Burlington that the intent of this portion of the rule is that where the presence of certain fixtures in place on the car indicated that a yoke could not leave the car while it was still intact, it was conclusive evidence that such yoke must have been broken before being pulled out. This case, the Burlington stated, seemed to support its views. On Illinois Oil Company car No. 313 the yoke is around the middle spring seats, draft spring and transverse keys which pass through the center sills and the front and rear ends of the yoke space. In this instance the transverse keys were undamaged and in place, and as these keys pass through both center sills and also through the yoke, front and back, carrying the spring seats and supported by the spring, it was a physical impossibility, the railroad contended, that such a yoke could be released from the car unless it were broken. The transverse keys, as long as they were undamaged and in place, could not possibly permit an intact yoke to be pulled free of the car. Similar examples which were possible, with respect to draft-gear construction were also cited by the railroad in its statement by referring to the Bradford and Cardwell gears. The Burlington contended that its material charge for the coupler-yoke in this case was clearly within the intent of Rule 95. It also believed that the rule should be clarified to cover conditions in this and similar cases, or an interpretation should be issued to apply.

The Arbitration Committee rendered the following decision on November 5, 1931: "That portion of Rule 95 reading, 'except where draft gear is in place and the coupler with its yoke is missing, material of such yoke and its rivets may be charged against car owner,' is intended to cover cases where the presence of the draft gear in whole or in part would prevent the unbroken yoke from pulling out, and in the event of its pulling

out under such conditions, it would be only reasonable to assume that the yoke failed. From the statements submitted, the indications are that the presence of the draft gear in part rendered it impossible for an unbroken yoke to pull out. The contention of the Chicago, Burlington & Quincy is sustained."—*Case No. 1689, Illinois Oil Company vs. Chicago, Burlington & Quincy.*

[An abstract of case No. 1640, Trinity & Brazos Valley vs. Texas & New Orleans, was published in the October, 1930, issue of the *Railway Mechanical Engineer,* page 583. To clarify the intent of Rule 95, the Arbitration Committee recommended at the 1932 convention of the Mechanical Division that the first paragraph of this rule be modified. The proposed form of this rule appears in the report of the convention which was published in the July issue of the *Railway Mechanical Engineer,* page 275.—EDITOR.]

### Passenger Cars in Interline Service—Rule 3

The Minneapolis, St. Paul & Sault Ste. Marie, in conjunction with the Canadian Pacific, operates line service between the Soo Line Terminals at Chicago and St. Paul, Minn., and C. P. R. terminals at Moose Jaw, Sask., Banff, Alta., and Vancouver, B. C. The equipment used is owned by both railroads and, in addition, a number of Pullman cars are used, as the territory between Chicago and St. Paul is known as Pullman territory. From time to time extra cars are dispatched from Chicago or St. Paul in regular line-service trains, but for any of a number of reasons are set off en route. The same condition exists with respect to the reverse movement of cars started from Vancouver to Banff or Moose Jaw. The total one-way mileage for this joint-line service is 2,054 miles. Special cars are frequently placed on trains at Chicago or St. Paul for the accommodation of special parties moving to points on the C. P. R. off the regular line route, such as Saskatoon, Sask. Such cars are set off line-service trains moving west and picked up by a train moving north on the branch line. Several examples were cited in the brief statement of facts to illustrate the manner in which sleeping cars were set off from line-service trains at intermediate points and either deadheaded to the original terminal, or switched to branch-line trains. The C. P. R. contended that a car to be classed as a line-service car must be a car operating in a regular course as per passenger Rule 3, and that extra cars operated from a line-service terminal of the Soo Line to some point on the C. P. R. lines, or vice versa, whether on the line-service route or off the route to some branch or other portion of the main line, should be considered as an interchange car. The Soo Line contended that paragraphs *a* and *b* of Rule 3, which classify a regular-line car as against an interchange car, clearly intend to distinguish between cars in special service as against cars provided in the regular line run with its auxiliary over-flow cars made necessary because of the originating line's inability to forecast the exact number of cars necessary to transport the passengers. In its statement the C. P. R. claimed that an extra car leaving a line-service terminal of either railroad and not moving the entire distance from one line-service terminal to any one line-service terminal of the connecting line should be considered an interchange car, and the expense for cleaning, etc., should be absorbed by the handling line. The C. P. R. considered it not correct to assess cleaning and supply charges on extra cars from Chicago and St. Paul which are set out short of line-service terminals and are not returned to Chicago or St. Paul in regular course, or as extra cars out of St. Paul or Chicago transporting special parties to points on its lines which can be reached from some point on a line-service route. In its statement the Soo Line pointed out that the dispute between the two railroads was as to the proper allocation of car-cleaning costs between the two railroads and as to the proper distribution that should be made of such costs on regular line-run cars as against cars moving in special service, described under Rule 3 as an interchange car. It contended that special cars started by the Soo Line destined to off-route points on the C. P. R., which service is irregular and special, establishes the line of demarcation against the service of regular-line cars with their auxiliary service in the provision of over-flow cars. Line-run cars, the Soo Line stated, are not used for the exclusive use of passengers destined to line-run terminals. Such cars also take care of business for intermediate stations, short or beyond the regular-line terminal, and when regular-line cars are loaded and it becomes necessary to put on over-flow cars, the railroad must handle the business for any point handled by the line-run car. The fact that these cars contain passengers destined to a regular-line terminal, the Soo Line contended, intermediate or points beyond served by regular-line cars, as agreed between the two railroads, does not alter the status of the car as described in the rules. Such cars are run to care for patrons in excess of the space provided in the car assigned to such regular-line runs. The Soo Line attached to its statement as an exhibit a circular issued by the general-passenger department of the C. P. R. which it contended showed the intent of the C. P. R. in establishing the regular-line cars with auxiliary service. It also contended that the circular showed that the diversion of the regular- or auxiliary-line car from the regular-line terminal does not establish the destination between the regular-line and the interchange cars, as claimed and described in the A. R. A. Passenger Code. The fact of a car going bad order, the Soo Line said, or the C. P. R. having to divert it to a point other than that ordinarily run because of high water, wrecks or other physical conditions; its desire for economical reasons to combine passengers from one or more over-flow cars into one car, is not a reasonable application to the rule. The miscellaneous handling in its very nature removes it from the standard intended to more easily determine the character of the car and the proper distribution of the incidental costs involved in the general handling thereof.

The Arbitration Committee rendered the following decision April 7, 1932: "Where car lines are established by approved operating agreements and extra cars are required to handle overflow business in said lines short of regular-line car terminal, the extra cars shall be considered as part of the line-service and the expense of terminal attention, as defined in Rule 3, shall be apportioned on a basis of actual mileage made by the cars in question."—*Case No. 1690, Canadian Pacific vs. Minneapolis, St. Paul & Sault Ste. Marie.*

## Hose For Handling Liquids

THE DeVilbiss Company, Toledo, Ohio, has perfected an improved fluid hose for the handling of various liquids. Tests conducted in the laboratories of the DeVilbiss Company show that the absorption of lacquer thinner by this hose is only 1.8 per cent and

that hot turpentine, the worst enemy of rubber hose, has no apparent effect.

The outstanding characteristic in the physical construction of the DeVilbiss fluid hose is found in a new composition which is used in the liner of the hose. This composition contains a very small quantity of rubber. The liner composition of the hose is a development of the laboratories and, while it is not of such a nature that it can replace rubber in many of its familiar uses, it has, nevertheless, been found to surpass rubber as a material for lining fluid hose.

## Handy Hook For the Rip Track

WHEN a car is shopped out and placed on the rip-track due to the coupler being low there is only one permanent way in which it can be raised. That is by applying shims under the truck springs on both sides of the truck bolster. If the car happens to be loaded it is necessary to place 50-ton jacks under both sides to take the weight of the car from off the truck bolster.

In order that this work could be performed in one jacking operation a car foreman devised the hooks shown in the illustration, one of which is shown in position. The lower end of the hook is slipped into the end of the truck bolster and the top end is hooked over the edge of the body bolster. Thus the truck bolster is raised sufficiently when the car is jacked up to insert the shims under the springs without the use of additional jacks.

With this device a truck bolster can be held up when the car is jacked up

The hooks are made from a piece of ¾-in. by 2-in. wrought iron and for the ordinary 70-ton hopper car should be 25 in. long with a 3-in. bend at one end and a 5-in. bend at the other. There must be a twist in the center of each hook to set the bends at proper angles to the body and truck bolsters. Only one hook is required. A second hook is illustrated to show the manner in which it is formed.

If the hooks are made long enough to permit considerable separation between the body and truck bolsters, the car men can apply lubricants to the center plates during the same operation.

## Device Used in Applying Yokes to Couplers

THE device shown in the illustration, if used when the coupler yokes are applied to the couplers, will eliminate, in many instances, the necessity of heating the yokes to make them conform to the coupler butt.

A piece of wrought iron 1½ in. thick, 14 in. wide and 24 in. long with a 7-in. by 12-in. opening provided as shown will allow it to be driven from the back of the yoke toward the riveted end. This holds the yoke firmly against the coupler butt while the yoke rivets are being driven. It is sometimes necessary to draw the yoke together as much as two inches and when this is done considerable strain is placed on the jaws of the device. For this reason it should be made from wrought iron of sufficient thickness (1½ in. to 2½ in.) to prevent the jaws from spreading. Usually after the yoke rivets are driven into place the device will loosen up sufficiently to permit its removal without the aid of a maul. However, yokes which have been distorted are liable to cause a binding effect and make it necessary to drive the device to the extreme end of the yoke in order to remove it.

The clamps keep the jaws from spreading

The width of the jaws depends on the size of the

coupler butt. This makes it necessary to have three devices available, each conforming to the size of the coupler butt plus the thickness of the coupler yoke.

## Pneumatic Vise For Steam Hose

THE pneumatic vise shown in the illustration is used for holding steam hose clamps either during their application or removal. This vise holds the steam hose in a rigid position while the nuts are either applied or removed from the clamp bolts with a power wrench. An 8-in. brake cylinder is mounted on a work-bench in the hose shop using a piece of 1½-in. by 6-in. by 48-in.

**Steam-hose clamps are easily applied with this vise**

bar iron as a base. The outer end of the bar-iron base is bent upward to a height of 8 in. and on the inner side, toward the piston push rod a piece of wrought iron, formed to the contour of the hose clamp is either bolted or riveted. A piece of ½-in. by 3-in. strap iron is formed in the manner shown and attached to the bench in a suitable manner to support the opposite end of the steam hose.

The length of the stroke of the piston push rod can be reduced to 5 in. by inserting a block in the back of the cylinder. This will also reduce the amount of air required to operate the vise.

## Radiator Protector For Shop Tractors

IN ADDITION to the lift trucks which are provided on practically every up-to-date rip track there is also a tractor provided for the delivery of such material as triple valves, rivets, draft gears and other car parts. Such materials when delivered to the immediate location of the workmen reduces handling costs and eliminates the necessity of the workmen leaving the car. Unless some provision is made to protect the radiator of the tractor serious damage is going to result due to coming in contact with various obstructions.

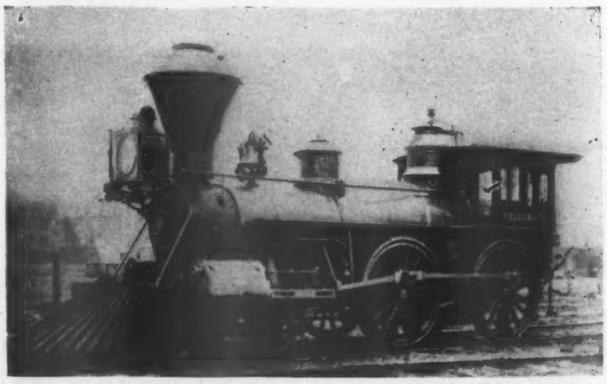
The tractor shown in the illustration has been equipped with a piece of ½-in. boiler plate through which has been drilled 35 1½-in. holes to afford the necessary ventilation. Two 6-in channels are attached to the frame of the tractor and welded to the front protector plate. Two braces made from 3½-in. angle iron are welded to the protector plate at the top and to the

**The heavy plate grill on the front of this tractor protects the radiator from damage**

channel at the bottom, thereby making the protector plate sufficiently rigid to enable the tractor operator to use the tractor both for pulling and pushing cars or delivery trucks.

In the center, at the top of the protector plate a marker bracket can be either bolted or welded to provide for carrying the necessary light when the tractor is used at night.

* * *



*From collection of W. A. Lucas*

**Atlantic & Great Northern "Telegraph" 4-4-0 type locomotive No. 84 built at Jersey City, N. J., in 1864**

# In the Back Shop and Enginehouse

## Air-Brake Repairs Centralized

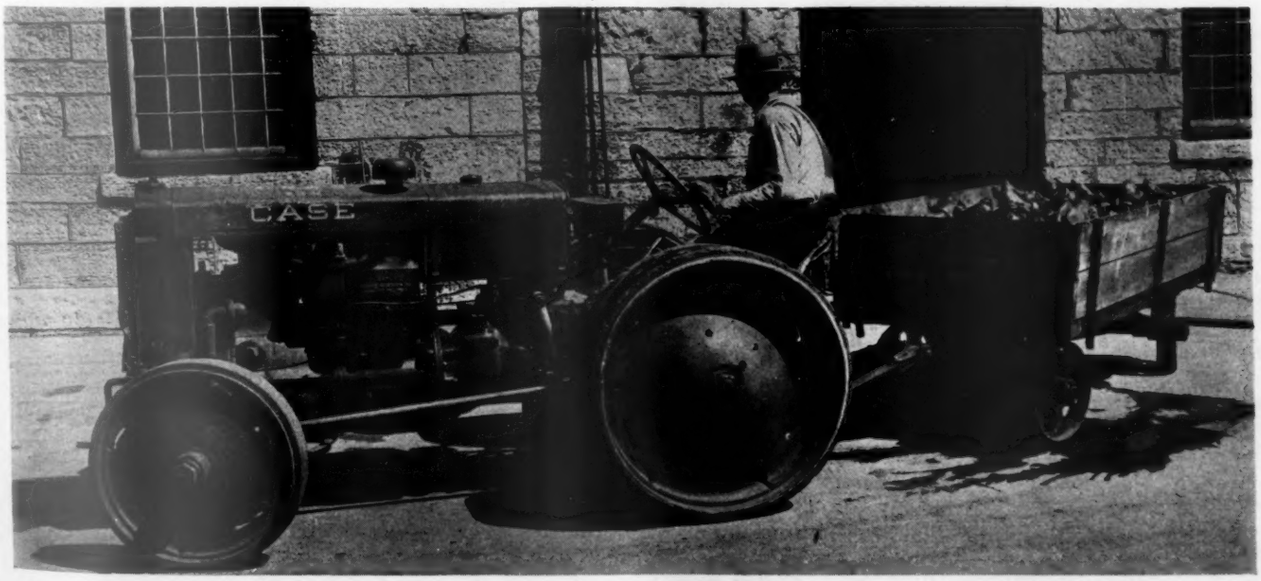
PRACTICALLY all the general overhauling of air-brake equipment parts on the Chicago, Burlington & Quincy, Lines East, is done at the central air-brake shop at Aurora, Ill. This air-brake shop, fully supplied with tools and equipment for the expeditious handling of the work, repairs and tests all types of air-brake equipment, including passenger and freight triples, UC-12 equipment, enginemen's brake valves, pump governors, passenger rail-car brake equipment, air compressors, etc. In addition, miscellaneous parts used in the repair of this equipment are manufactured in quantities, as required.

Work in the Aurora air-brake shop is stressed for thoroughness in overhauling valves and equipment and a high degree of accuracy is required in all details. Wear limits for vital air-brake parts must usually be measured in thousandths of an inch, and this high degree of accuracy is secured by the use of numerous "go" and "no-go" gages, micrometer indicating gages and micrometer calipers. Some indication of the accuracy insisted upon for all parts of the air-brake equipment is afforded by the fact that triple valves, for example, are rejected and returned to the repair line when the leakage test shows a leakage in excess of 3 lb. of air per min.

While repair operations in the Aurora air-brake shop present few striking innovations in practice, the way in which the work is organized on an efficient production basis is shown by the thorough overhauling of from 88 to 90 triple valves per eight-hour day, when the shop is working a full force, with a total of 11 men engaged on this work. These men include two strippers, one lapping-machine operator, one grinding-machine operator, five assembly men and two testers. The time for completely overhauling a triple valve ready for the test rack averages 55 min. When repairs to the slide and graduating valves are not required, this time is reduced to 27 and 30 min. per valve.

All parts of the air-brake equipment overhauled at Aurora shops are received and distributed through the supply department. New parts used in the repairs are ordered in quantities and carried in stores stock, being drawn as needed. Triple valves, loaded on trailers, are repaired on order from the stores department. These valves are repaired and tested in the air-brake shop in practically a straight-line movement without back

**Triple valve bodies ready for grinding the valve bushings on the Heald No. 55 internal-grinding machine**




**Tractor and trailer with a load of triple valves just overhauled at the Aurora air-brake shop**

travel. They are stripped and cleaned in about 11 minutes per valve, a special volatile oil bath being used which cleans all parts thoroughly, but does not present a fire hazard. All parts are allowed to soak for a short time, then being blown out and thoroughly cleaned of dirt and scale.

At this point in the operation, an inspection permits dividing the triple valves into two classes, namely, those which require complete disassembly and overhauling, and those triples in which the good condition of the slide and graduating valves and seats will evidently permit the valves to meet the test requirements without further work on these parts. In the latter case, slide and emergency valves are cleaned and lubricated with graphite, the only type of lubricant used in this work. Both cleaned and overhauled triple valves are required to pass the same rigid tests before being returned to the stores department for delivery to repair points.

After cleaning, all triple-valve parts, in so far as possible, are reconditioned and brought back to standard. Valves with piston bushings over .001 in. out of round, or tapered, are set aside and either rebushed or ground in lots of 50 to 100 on a Heald No. 55 internal grinder. The pistons are gaged for length and brought back to standard, the ring grooves being upset and new grooves of the proper dimensions cut. Piston rings are gaged for thickness and diameter and placed in a special holding drum, 30 at a time, clamped in an arbor, the drum removed and the rings ground to the next

**Some of the many "go" and "no-go" wear limit gages—Reclaimed pistons and rings are stored in small cardboard boxes for protection**

smaller of four-step size. This permits the re-use of piston rings fitted properly in the ring grooves and lapped to an accurate fit in the new or ground bushings.

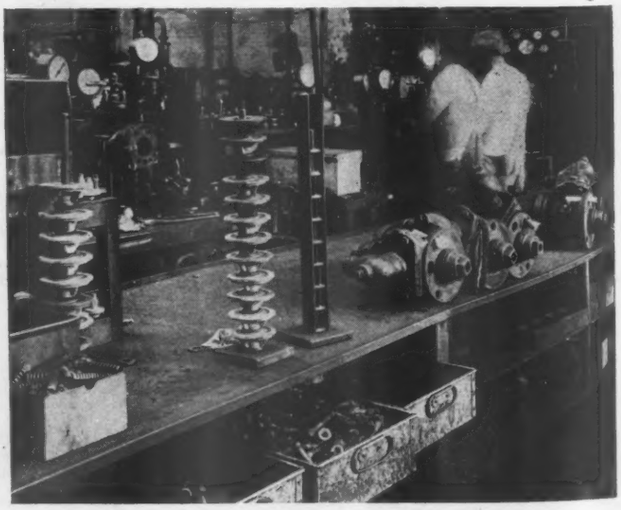
The Heald grinder, on which triple-valve bushings are ground in an average time of 7 to 8 min., floor to floor, is used extensively in air-brake repair work of all kinds. Reverse-valve bushings for air compressors and small bushings on feedwater pumps are ground on this machine, which has demonstrated its adaptability for rapid and accurate internal grinding of all kinds within the range of the machine.

After cleaning and inspecting, the triple-valve bushings pass to a Foster 15-spindle lapping machine, in which the slide valves, previously trued on a Foster semi-automatic valve-finishing machine, are lapped to an accurate fit on the slide-valve seat. The valves then pass to the assembly bench where 4 to 6 men are worked, as needed, depending upon the requirements. At this position, the final fitting of piston rings and hand lapping of slide and graduating valves is done. Emergency valve seats, machined in quantities, are trued with a special tool made for the purpose. The valve stems are straightened and rubber seats renewed. Check-valve case seats and valves are machined and milled in quantities, a light finish grinding operation being given by hand. Composition gaskets are reclaimed by boiling in a lye vat to clean and slightly soften the packing. If not defective in other ways, these gaskets are then refaced

**Two shop-made, air-driven brake-valve lapping machines—Speed and eccentric motion control handles shown**

at the sealing joint by the light application of a revolving sand paper disc in conjunction with an air blast to keep the disc clear of all dust and packing particles.

All triple valves are tested by two test-rack operators on standard 3-T test racks. The test requirements are 3 lb. or less ring leakage per minute for both cleaned and thoroughly-overhauled valves. All valves, in passing the tests, are turned back with a notation as to the cause of failure. Valves marked O. K. move forward to the delivery bench where a helper applies small pipe caps and larger sheet-metal caps for protection in han-



**View of one of the work benches—Ingenious portable stands for emergency valves and seats shown**

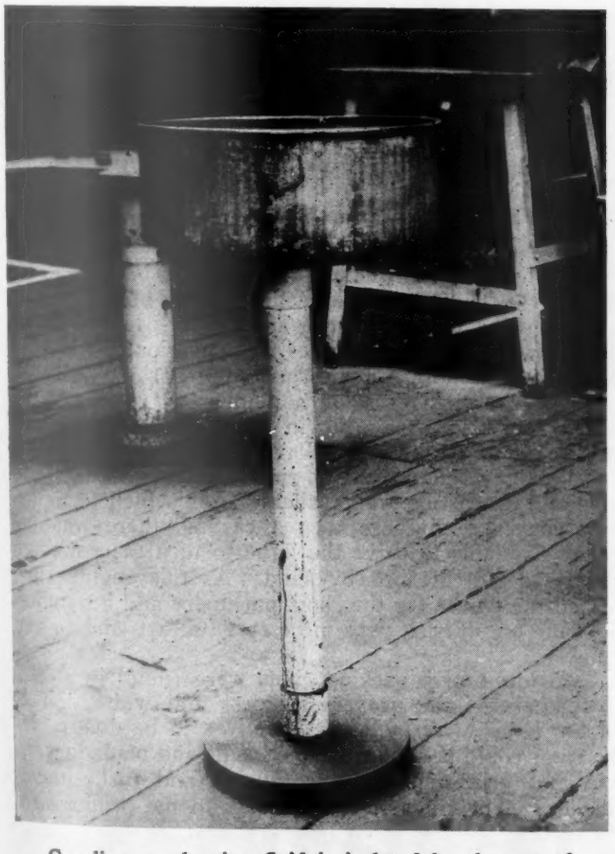
dling. All valves are stencilled with the Aurora shop mark.

Similar methods are used in making repairs to all other air-brake parts and valves, including brake valves, pump governors, etc. Air-pump governors, for example, are repaired more accurately than is usually the practice. The main-piston bushings are bored in steps of .004 in. instead of 1/32 in., only the standard size pistons being used. The use of step-cut rings assures a very close fit, which must stand a leakage test not to exceed 5 lb. per min. The Aurora air-brake shop is fully equipped with racks for testing these governors, distributing valves, UC-12 valves, brake valves, feed valves, etc. Similar test racks and a fully-equipped air-brake shop are provided at Havelock, Neb., for the repair of all air-brake parts and equipment on the Burlington, Lines West.

## Portable Cleaning Vats For the Air-Brake Shop

WHEREVER gasoline is used in the shop a fire hazard is created regardless of whether it is handled in approved containers, open receptacles or in ordinary make-shift containers.

The portable cleaning vat shown in the illustration is being used with considerable success in the air-brake shop of an eastern railroad. The tray is kept one-third full of clean gasoline or other standard cleaning fluid and is less liable to splash out while being used than if a greater quantity were used. The stand is made from three-inch galvanized pipe and is mounted on an 18-in. diameter base. The base is made from 1¼-in. steel and is of sufficient weight to prevent tilting. The top of the stand is made from a piece of ½-inch boiler plate which is welded to the pipe sleeve. The total height of the stand is 30 in. A tray made of galvanized iron, 24 in. in diameter and five inches deep, is kept on the stand at all times and any material which the workman desires to clean must be brought to the cleaning vat—the vat being in a convenient location where it is accessible to the majority of the men.



**Gasoline or cleaning fluid is isolated by the use of these receptacles**

It is the responsibility of the foreman in charge of the shop to see that workmen are not careless with the cleaning fluid and permit it to splash over the floor. Any workman found violating these instructions is subject to discipline.

## Hand-Operated Air Compressor

THE Westinghouse Air Brake Company, Wilmerding, Pa., has developed a hand-operated air compressor which provides a quick source of air pressure for testing, inflation and other pneumatic operations remote from the usual sources of air supply. (One railroad uses it to raise the pantograph into contact with the overhead wire when removing electric locomotives from storage.)

A variable piston stroke and handle leverage make the pump easy acting. At the start of the stroke, when the pump pressure is low, the piston movement is large in relation to handle movement. At the end of the stroke, when the pump pressure is high, the piston movement is short while handle travel is relatively greater. Moreover, handle leverage increases with the stroke. As a result a maximum effort of only 37 lb. is required on the handle in pumping against 80 lb. pressure.

**A hand-operated air pump designed for use where air pressure is not available**

The cylinder is seamless brass tubing which screws into a cast-iron base. A ball inlet valve and Wabco-seated discharge valve are compactly arranged in the

base at the end of the cylinder, reducing clearance volume to a minimum and providing maximum air delivery from a total displacement of 26½ cu. in. per stroke.

Two adjusting nuts act as a piston stop to limit the stroke, transmitting all shocks to the frame. This protects the piston and packing cup, maintaining straight travel of the cup in the cylinder and thereby minimizing packing cup wear. The cup is of Wabco material. The complete weight of the pump is 16 lb. and its height 13 in.

## Curing Your Cylinder-Packing Ills

*By G. Dempster**

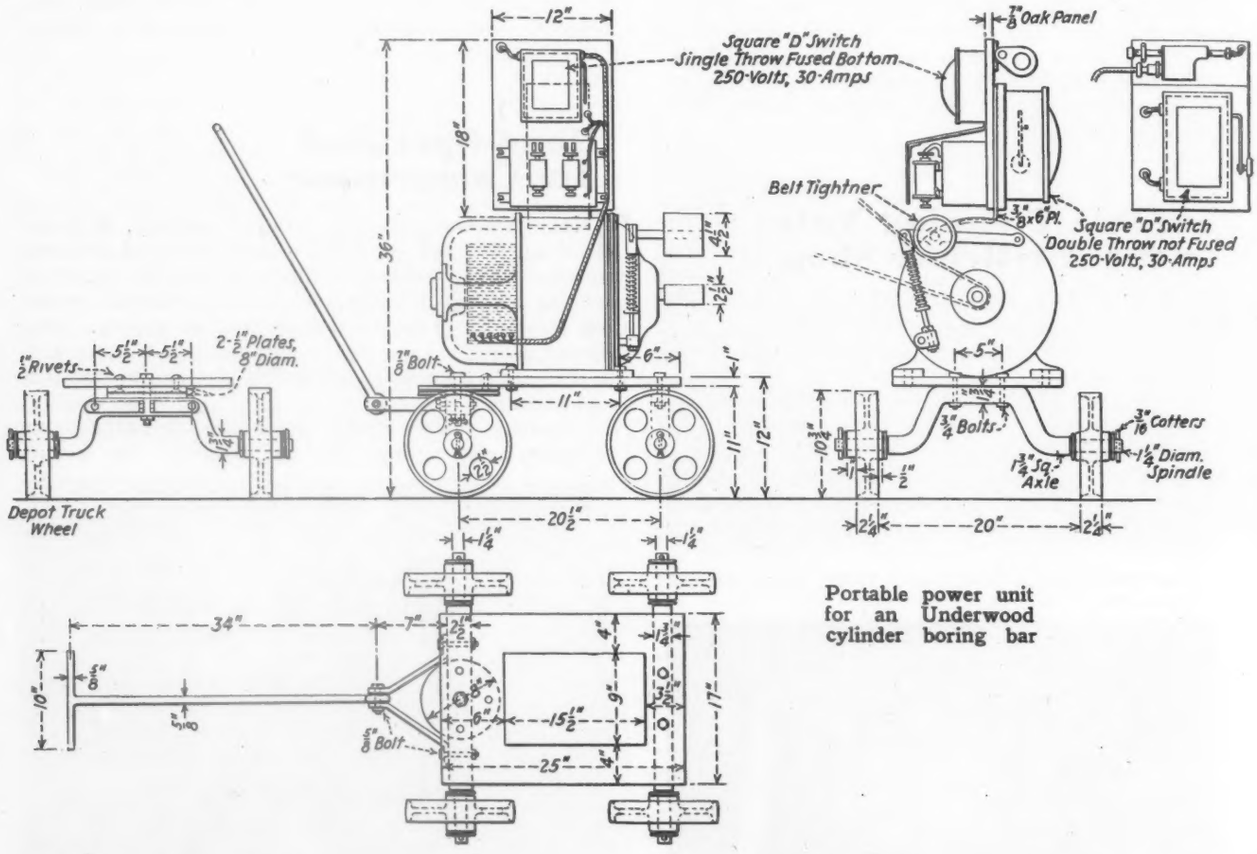
YEARS ago when locomotives were smaller and the working steam pressures were lower than at present, and a much softer grade of gray-iron casting was used for making cylinder-packing rings, it was the practice of the repair man to pein cylinder-packing rings on the inside to expand them when they had become loose in the cylinder and were allowing steam to blow past the rings causing what is known as cylinder-packing blow. The peined ring in most cases was superior to the new ring as it had more life and spring to it.

The writer had occasion a number of years ago to call this idea into play, but in reverse form, when the rings of a large Corliss stationary engine became worn and broken. There were no rings on hand for this engine and no casting was available from which to make new rings. Had there been a casting, there was no power available to drive the lathe to turn the packing, except to pull the belt by hand. As this engine furnished the power for the shop machinery and a number of men on duty it was necessary to act and to act quickly.

Two locomotive packing rings were found in stock, fortunately of the proper thickness and width, but 2 in. too large in diameter. What was to be done? If the rings could be peined on the inside and made larger, why not pein them on the outside and make them smaller? The rings were peined in to the proper size

* Mr. Dempster is master mechanic of the Alabama, Tennessee & Northern, York, Ala.

*(Continued on next left-hand page)*



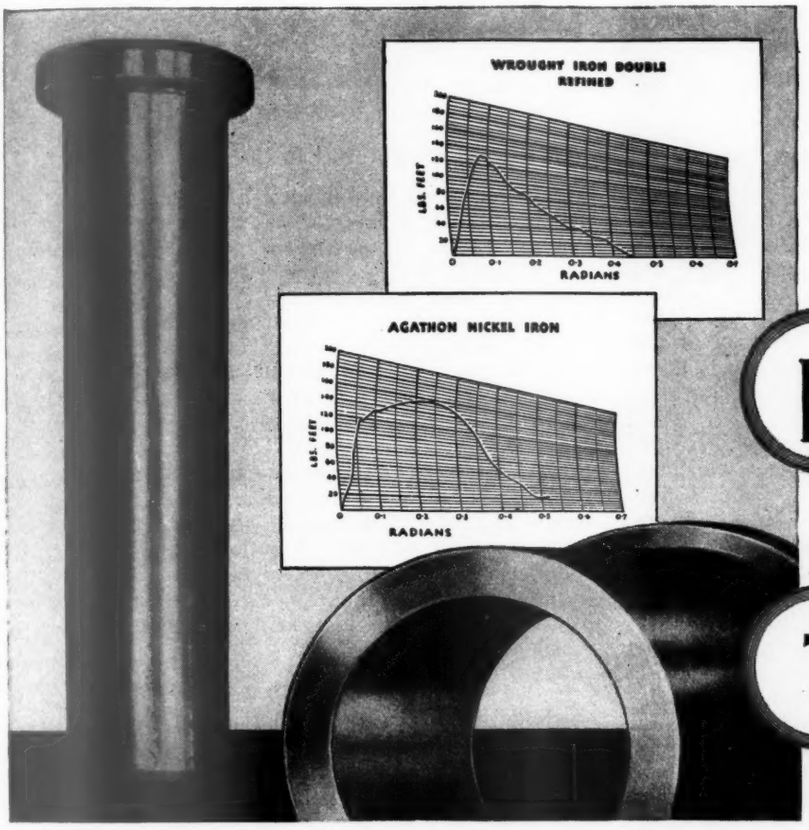

**Portable power unit for an Underwood cylinder boring bar**

## Motor Truck for Cylinder Boring Machine

SHOWN in the drawing is a four-wheel truck on which is mounted a Westinghouse No. 20, type SK, 3-hp., 230-volt, 12.1-amp. variable-speed motor. This portable electric power unit is designed for use in conjunction with an H. B. Underwood cylinder boring bar, arranged for belt drive.

The cylinder boring bar is mounted on the locomotive and necessary adjustments made. The electric power unit is then placed in position beside the cylinder to be bored and a belt is placed over the operating pulley of the boring bar and the motor pulley. The pulley on the motor shaft is 2½ in. in diameter and is used with boring bars having operating pulleys 14 in. in diameter. A 4½-in. idler pulley is provided to keep the belt taut.

The switch panel is mounted directly above the motor. Two Square D switches are provided—a single-throw fused-bottom switch and a double-throw switch. The control equipment and motor are mounted on a four-wheel truck having a platform body, 17 in. by 25 in.




# HARD ! *to resist wear*

# TOUGH ! *to resist shock*

## AGATHON NICKEL IRON .. combines the qualities that are needed for pins and bushings

Pins, bushings and similar wearing parts need a hard case to withstand wear and reduce repair work. « Then a second element—shock resistance must also be included. « Agathon Nickel Iron has the unique property of taking a fine case and then backs up this case with a tough core to take the shocks that would shatter the usual materials. « How well Agathon Nickel Iron backs up a hard case with a tough core is shown by the above charts. « The Humphrey Machine which produced these charts, bends the full section to the breaking point of the case and then on to final rupture. The first break in the line indicates the point at which the case was first cracked; the rest of the curve shows the resistance of the core to rupture. « The core of the wrought iron shows rapidly diminishing resistance as the angle of bending increases. « Agathon Nickel Iron, on the other hand, shows stubborn resistance even after the case is broken. The core is tougher and uniform in composition. « Use Agathon Nickel Iron for all case-hardened parts.

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Staybolts, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Nitralloy • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel (20-27 Carbon) . . . . . .

AGATHON NICKEL IRON

CENTRAL ALLOY DIVISION

**REPUBLIC STEEL CORPORATION**

MASSILLON, OHIO

and in a short time the engine was at work and everybody busy. Years later, when this engine was overhauled, the rings, although worn very thin, were still hugging the cylinder walls and were tight in the cylinder. This was the birth of an idea that worked out good on a number of occasions.

### Peining Rings to the Shape of Worn Cylinders

During the war when it was very necessary to keep the power in service and trains moving, some locomotives with badly worn cylinders were reported by the enginemen trip after trip as blowing badly. This not only caused a great waste of fuel, but caused a reduction of tonnage handled by these locomotives. This defect was remedied by peining rings to the shape of the cylinders and there were no more reports of these locomotives blowing. This occurred on a short-line railroad in the south.

On several later occasions, the writer, as night foreman at an outlying point, on a large western railroad, without suitable rings in stock, kept some heavy passenger locomotives moving and some highly advertised passenger trains on time by peining 28-in. rings that were made for the heavy freight locomotives down to fit the 26-in. cylinders of the passenger locomotives.

After some experimenting and study the writer adopted this as the standard method of preparation and application of packing rings on a short-line railroad and for the past nine years no other method has been in use. This has resulted in a saving of thousands of dollars in fuel, as the rings are tight from the start instead of as with the old method where the rings bear at three points and stand away from the walls of the cylinders at two points. The old method leaves large openings through which the steam blows badly until after a long time when the rings finally wear down to a bearing. This method of application also saves many renewals of rings, thus effecting another saving in labor and material.

### Peining Rings to Fit Has Saved Money

All rings are stenciled with the date of application to keep a check on the performance of the rings. Following is the record of one locomotive: Six years actual service, more than 135,000 miles, 237,600,000-ft. piston travel on a 20-in. by 24-in. saturated-steam locomotive carrying 200-lb. steam pressure. About four-fifths of this mileage was made on local freight with a great deal of switching and the balance on a 147-mile through freight division. These rings were applied November 29, 1923; removed from the left cylinder on account of applying a new crosshead on March 6, 1930; one ring was found broken, a piece 8 in. long being broken off the end. A new ring was applied in place of the broken one. The rings were removed from the right cylinder May 1, 1930, when the locomotive was shopped for heavy repairs. The two rings from the right cylinder were then applied to another locomotive of the same class and used for some time until lost track of. The rings when removed from the first locomotive were worn from the original thickness of 11/16 in. down to 17/32 in. at the thinnest point. The cylinders were worn less than 1/16 in., in fact, not enough to require reboring; neither cylinders nor rings were cut or scored in any way whatever.

On locomotives ranging from those in light passenger service to the heavy type equipped with superheaters, 24-in. by 28-in. cylinders, carrying 200-lb. steam pressure and making over 50,000 miles per year (a total of 16 locomotives) the rings are in service and going good 4½ and five years on the lighter power and run 2½ and three years on the heavier power. In most cases the rings are still good after the heads are worn badly enough to require renewals. The renewal of packing rings seldom occurs except when a locomotive is in the shop for heavy repairs and new heads are applied or built up for re-turning and then because it is not considered good practice to use old rings on new heads.

### Good Grade of Material Is Used for Packing Rings

Contributing to the long life of the rings are several factors: Sufficient lubrication, good water conditions, washing boilers at regular intervals in order to keep down foaming and the consequent washing off of the lubricant. Let it be emphasized, a good grade of material is used from which to make the rings. There are, no doubt, other materials that would give equally as good service, but the material used is what is known as semi-steel. This, so the manufacturer claims, is a perfect fusion of steel and gray iron, fifty-fifty, and obtaining a uniform casting. This material machines like and has the appearance of a fine grade of gray iron and has a close fine grain. The writer feels that the method of preparation is in a large measure responsible for the long life and service of the rings. However, the combination of factors, as already mentioned, makes for good performance and to break the combination in any part would, to some extent, detract from this good record.

### How the Piston Rings Are Made

The method of preparation is as follows. For a 20-in. cylinder the ring is turned to 20⅞-in. in diameter, 11/16-in. thick and 1-in. wide. Two straight-cut rings are used to a piston, with a dowel 1-in. long which is made from the piece of the ring that was cut out. The ring is peined on the outside face at regular distances apart, usually about 2 in. to 3 in., depending on the size and thickness of the ring, until it is 5/16 in. larger than the cylinder. It should be peined more to bring it to the proper fit and bearing at points where it does not touch the cylinder when forced in. A little practice soon shows the mechanic just how and where to pein.

The peining is done by placing the ring over the horn of an anvil or similar device and holding the pein of an ordinary hand hammer on the ring and striking it with a heavier hammer. When the ring is properly fitted and placed on the piston, the piston placed in the cylinder, the valves are moved to cover the ports and the cylinder head is placed on the cylinder. With the cylinder head in place and the cylinder cocks closed, if the piston is moved in the cylinder by placing a bar against the crosshead, the vacuum created will pull the piston almost back to the point from which it was moved.

The average mechanic will doubt this and say, Oh yeah? And it does appear to be putting it pretty strong. But it is nevertheless a fact and all that is necessary to convince is a trial.

The long life and wear of the ring is due to the fact that at every point where the ring is peined, a small amount of the metal is made denser or compressed, at the same time stretching the metal on that side causing it to bend away from the spot peined. As more spots are compressed the more it bends away from that side and the smaller in diameter the ring becomes. As the ring wears in service, the compressed points are gradually worn away. The bending pressure is thus relieved and the ring gradually expands toward its original diameter. If of a good grade of material, it will continue to expand, not quite to its original diameter, but until it wears to at least one-half the original

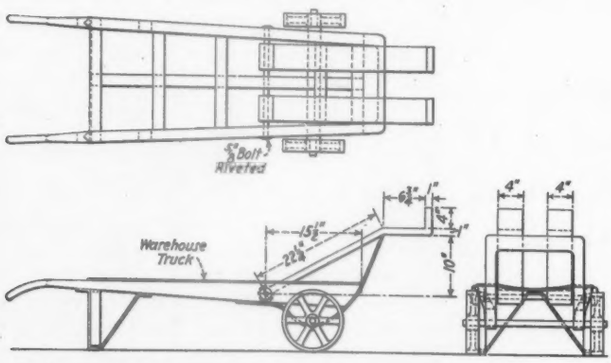
*(Continued on next left-hand page)*

thickness of the ring. It will always be tight in the cylinder, and a ring that is prepared as described will stand without breaking much more spreading in applying to the piston than the ring not peined.

Rings prepared by proper peining and of good material increase the wear and life of the ring as much as 300 per cent and should, under favorable service conditions, run from heavy to heavy repairs of the locomotive. The saving in fuel begins with the first time the locomotive is fired up and used. As fuel is one of the largest single items of expense on a railroad, only a small saving per mile means a vast sum of money in a year's time.

## Truck for Handling Pedestal Binders

SHOWN in the drawing is a truck which is used in the shops of a western road for handling pedestal binders. It is made from a warehouse or station truck. A 5/8-in. through bolt is inserted through the




**Station baggage truck converted to a truck for handling pedestal binders**

frame of the truck and both ends are riveted over. To this bolt are pivoted two 1-in. by 4-in. bars which are forged in the blacksmith shop to the shape shown.

## Milwaukee Apprentices Doing Machine Work

UNDER normal conditions, apprentices are given a widely diversified course of training, both in the schoolroom and in various shop departments of the Chicago, Milwaukee, St. Paul & Pacific. Three machine operations being carried on by apprentices at the Milwaukee shops of this road are shown in the illustrations. That at the left illustrates the cutting of teeth on three reverse-lever quadrants at one setting on a plain knee-type miller, using a special jig with adjustable radius. The operation of checking the center distance with a tram is illustrated. The quadrants are forged to the proper cross section, rolled to the desired radius, ground on the side and the teeth quickly and accurately cut in the milling machine, as illustrated.

The familiar operation shown in the center illustration consists of turning driving-wheel tires in a modern, heavy-duty wheel lathe. The average time, taking wheels as they come, large and small, with some tires having hard spots which are difficult to machine, is one hour per pair of wheels, floor to floor. Only advanced apprentices, usually in their fourth year, are given work on the wheel lathe, under the close supervision of the apprentice supervisor and the shop foreman.

The illustration at the right shows an apprentice sharpening a Rapid flue cutter by milling new teeth in the circumference. This flue cutter is in effect a high-speed friction saw for cutting off tube and flue ends preparatory to safe-ending. The teeth eventually become worn to a point which greatly reduces the efficiency of the cutting operation. The saw is then taken to the toolroom and new full-size teeth formed, using a hobb-type cutter in the universal knee-type milling machine, illustrated.

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HAVEN FOR EGGS—The railways of this country are not the only ones which know how to treat an egg right. The Great Western Railway in England transported 1,000,000 eggs by express freight train between Truro and Paddington during a 12-month period. Of this number, less than 120 were broken or cracked in transit.

D. & H. PARADES MODEL LOCOMOTIVE—As a part of the celebration of the dedication of the Port of Albany, N. Y., the Delaware & Hudson provided a float, exhibiting a model of its locomotive No. 653 complete with tender. The model was fabricated and assembled in the car department, and was exactly one-third the size of the original. The boiler jacket, dome, cylinder casing and reservoir shield were of sheet metal construction, while the other parts were largely of wood. The job of building the model called for skilled workmanship, since the machinery available was not suitable for turning out the small parts necessary. Consequently, such details as the motion work, dome springs, wheels, etc., required shaping by hand. As is the case with this stream-line design of locomotive, the whistle and bell were concealed. However, the distinctive sound of the steam chime whistle on the original No. 653 was cleverly reproduced by an air-operated whistle. This feature, together with the ringing of a concealed bell, received more than passing attention.

*(Turn to next left-hand page)*

**Three machine operations carried on by apprentices at the Milwaukee shops of the C. M. St. P. & P.**

# CONTROL

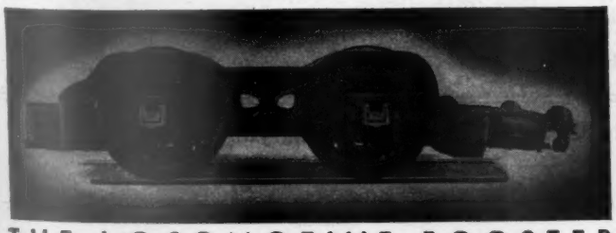
## DIRECT OPERATING EXPENSE . . . by proper locomotive assignment

BOOSTER-equipped Mikados cost less to operate than the plain 2-10-2. Two competing roads learned this in a series of competitive test runs between the two classes of locomotives.

Both roads were forced to the speed and improved service modern business now expects. The Booster-equipped Mikado demonstrated its ability to save 13.6% more in direct operating expense than the new, plain 2-10-2 type locomotive. This comparison shows clearly the economic advantage of The Locomotive Booster.

Not only does The Booster provide added power for getting up to road speed in half the time and for hauling heavy freights over ruling grades, but it also makes possible the assignment of locomotives so that normally they work at highest efficiency.

For road, hump and switching service, The Booster provides added power at low cost to meet all emergency demands. Are you taking full advantage of the economy it assures on both existing and new locomotives?



THE LOCOMOTIVE BOOSTER

**FRANKLIN RAILWAY SUPPLY CO., INC.**

NEW YORK CHICAGO MONTREAL

# NEWS

## N. Y., O. & W. Shops Damaged By Fire

ON JULY 25, for the second time in seven months, car shops of the New York, Ontario & Western at Middletown, N. Y., were the scene of a fire which destroyed a car house with a loss of $60,000. For a time the shop offices were in danger, but firemen confined the blaze to the building in which it started.

## Shopmen Return to Work

THE NECESSITY for getting cars and other equipment into shape for moving the grain and other crops that are now being harvested in the Middle West has led a number of roads to enlarge their shop forces. On July 6, the Missouri Pacific reopened its locomotive and freight car shops at Sedalia, Mo., giving employment to about 600 men. This shop will operate five days a week. The Minneapolis & St. Louis, on July 11, resumed work at its shops with 300 men after two weeks of inactivity, while the Minneapolis, St. Paul & Sault Ste. Marie reemployed 186 shopmen on July 5. The Havelock, Neb., shops of the Chicago, Burlington & Quincy resumed operation on July 11 after about a week of idleness, with 400 employees, while on July 5, 300 other shopmen were returned to work. The machine shops of the Chesapeake & Ohio at Peru, Ind., have been reopened after having been closed since March 15. The Chicago & North Western on July 1, reemployed about 200 men in its car shops at various points on the system.

## Plug and Ring Gage Blanks

AN AMERICAN STANDARD for plain and thread plug and ring gage blanks has been approved by the American Standards Association. This standard, developed by the American Gage Design Committee, includes terminology and details of construction for plain cylindrical plug gage blanks and handles; thread plug gage blanks and handles; plain ring gage blanks, and thread ring gage blanks, also taper plug and ring gages for checking taper lock handles and gaging members.

The American Gage Design Committee consists of a representative group of manufacturers and users of gages. The work done by this committee is complementary to that in course of development in the Sectional Committee on Allowances and Tolerances for Cylindrical Parts and Limit Gages (B4) which has been organized under A.S.A. procedure to standardize tolerances and allowances for fits between cylindrical parts, and the classification and establishment of tolerances for plain limit gages. The report of the American Gage Design Committee deals with details of the design of different kinds of gages, such as the nominal dimensions of the gaging plugs and the handles into which they are inserted, while the problem of Committee B4 will be to establish manufacturing limits and permissible wear for the gaging plugs in question.

## British Trains Accelerated

WITH THE RECENT introduction of greatly accelerated train schedules on many important routes, railways of Great Britain have completed a clean sweep of all speed records of importance, says a recent issue of "Railway Newsletter," official publicity organ of the British roads.

The accelerations effected in all parts of the country, which are to be greatly extended with the introduction of the summer services in mid-July, have given an enormous impetus to public interest in railway speeds, it continues. More powerful locomotives, increased track capacity and resignaling, have made it possible for train schedules to be tightened up almost everywhere.

Not only does Great Britain hold the record for the fastest "start-to-stop" journey on any railway in the world, but she now claims the record for the fastest non-stop run of over 100 miles in Europe.

The world's record is held by the famous "Cheltenham Flyer" of the Great Western, scheduled to cover the 77¼ miles from Swindon to Paddington in 67 min., at an average speed of 69.2 m.p.h.

The record for the fastest non-stop run in Europe of over 100 miles is now claimed by the London & North Eastern's 7:50 a. m. express from Leeds to King's Cross, which covers the last lap of 105½ miles, Grantham to King's Cross, in 100 min., at an average speed of 63.3 m.p.h. The same company has four regular daily trains making start-to-stop journeys at over 60 m.p.h.

Another notable example of speeding-up train services is provided by the 4:50 p.m. two-hour express of the London, Midland & Scottish from Birmingham to Euston. With the introduction of an extra stop at Coventry this train has been speeded-up to cover the 88¾ miles from Coventry to Willesden in 87 min., at an average speed of 61.2 m.p.h., no increase being made in the overall journey time between Birmingham and Euston, despite the introduction of the extra stop.

Some very fast trains are now running between London and south coast resorts, notwithstanding the fact there are heavy grades on all the Southern's lines to the coast. The "Southern Belle" and other London-Brighton expresses perform the journey of 51 miles in the even hour, while the "Bournemouth Limited" between Waterloo and Bournemouth and *vice versa* takes only two hours for the 108 miles—an average speed of 54 m.p.h.

From Waterloo to Salisbury the "Atlantic Coast Express" takes 90 minutes for 84 miles, much of it hard going from the locomotive point of view, while on the Eastern section trains between Charing Cross and Folkestone, and *vice versa*, cover the 70 miles in 80 min.

"In view of the constant efforts which are being made to speed up not only expresses but also local trains in all parts of the country," the Newsletter concludes, "no charge can be laid against British railways that they do not make use of the opportunities for fast running provided by powerful locomotives, perfectly-laid tracks, smooth-running rolling-stock and the finest system of safety signaling in the world."

## "Inside Control" of Car Heaters

HEATING PERISHABLE fruits and vegetables in refrigerator cars according to the temperatures within the cars, instead of following the common practice of heating them according to the outside temperatures, may result in substantial savings to shippers and in better maintenance of the keeping qualities of the fruit, according to an announcement made by the U. S. Department of Agriculture.

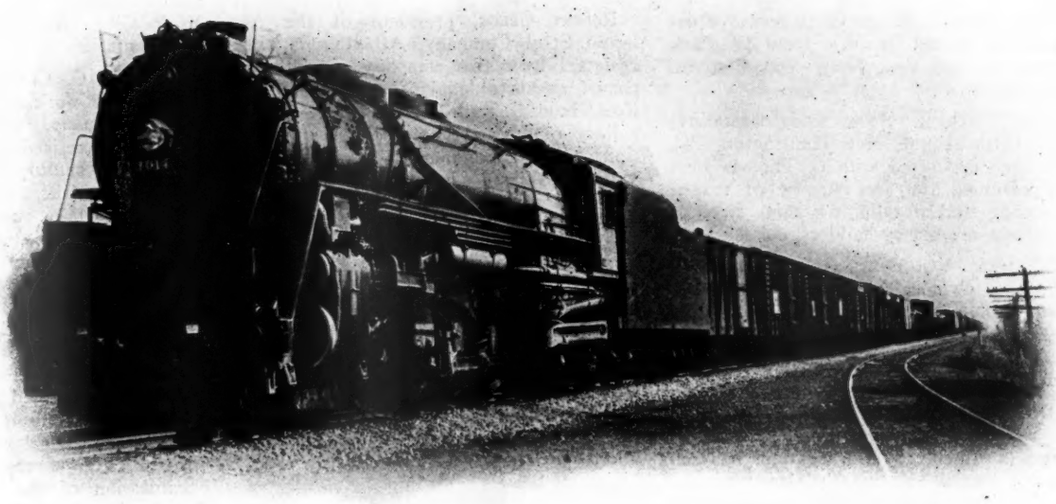
The Bureau of Plant Industry tested fruit shipped from Wenatchee, Wash., to New York in winter and found that when operating the heaters under the system known as inside control, the burners were lighted 30 to 40 per cent less than under the ordinary methods. No fruit was injured by freezing.

With inside control, the temperature of the air inside the car is the basis for lighting the heaters. The problem with inside control has been to get instruments that tell the temperature inside, but which can be read outside the car. In these experiments electrical resistance thermometers and bi-metallic thermostats gave satisfactory results. However, it is believed that manufacturers of thermometers and temperature-indicating equipment undoubtedly will be able to develop other instruments especially adapted for this purpose.

*(Turn to next left-hand page)*

## Domestic Orders Reported During June and July, 1932

| Name of Company | No. Ordered | Type | Builder |
|---|---|---|---|
| **Freight Cars June** | | | |
| Wheeling & Lake Erie | 50 | Gondola | Canton Car Co. |
| **July** | | | |
| Kansas City Southern | 25 | Gondola | Co. shops |
| **Locomotives June** | | | |
| Midland Continental | 1 | Gas-elec. | Whitcomb Loco. Co. |



# What About Locomotive Operating Expense?

From 1926 to 1929 inclusive, approximately 30 per cent of the total operating expense of Class I railroads was charged to the operation and maintenance of locomotives. This constituted the largest single item in the cost of producing transportation. It also offers the greatest opportunity for effecting substantial savings.

This can be accomplished by replacing obsolete or inefficient power with modern locomotives which operate at a greatly reduced cost per ton-mile. Reduced maintenance alone, as compared with locomotives only a few years old, will often pay for the new power within a comparatively short space of time.

Higher average speeds, greater tonnage hauling capacity, long locomotive runs and maximum dependability—these are the requirements of present-day traffic. They can be met only by high-wheeled, big-boilered locomotives of modern design, and of maximum sustained horsepower capacity.

As business increases, the savings effected by the immediate installation of modern power will be multiplied, insuring maximum net operating income for the future.

How about it?

*It takes Modern Locomotives to make money these days!*

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

# Supply Trade Notes

THE ROYAL RAILWAY SUPPLY COMPANY has moved its office from 250 Park avenue to 135 East Forty-second street, New York.

THE AMERICAN SHIM STEEL COMPANY, 1304 Fifth avenue, New Kensington, Pa., has been organized with C. Thomas Best as president, for the purpose of manufacturing and distributing shim steel to railroads, machinery builders, etc.

NORMAN W. FOY, assistant western manager of sales of the Republic Steel Corporation, with headquarters at Chicago, has been promoted to Chicago district sales manager, to succeed H. S. Schroeder, resigned.

J. E. BUCKINGHAM, western manager of the railroad division of the Worthington Pump & Machinery Corporation, has returned after a two months' leave of absence. Mr. Buckingham's headquarters are at the Chicago office of that corporation.

WILLIAM E. MILLHOUSE, general manager of the Burden Iron Company, Troy, N. Y., has been elected executive vice-president. The office of president, made vacant by the recent death of James A. Burden, will not be filled for at least a year.

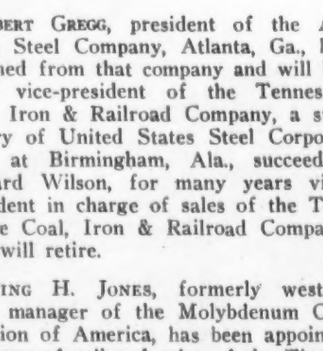
W. E. RIDENOUR, first vice-president and chief chemist of the Bird-Archer Company, with headquarters at Philadelphia, Pa., has been elected president to succeed P. B. Bird, who will remain as chairman of the board, at New York, and C. A. Bird, is now first vice-president and secretary, with headquarters at New York.

THE FRANKLIN RAILWAY OIL CORPORATION, with main office and works at Franklin, Pa., and division offices at New York, Kansas City, Dallas and Los Angeles, will handle sales, as the railroad department, specializing only in railroad lubricants, for oil companies operating throughout the United States as follows: Standard Oil Company of New York, New York; White Eagle Oil Corporation, Kansas City, Mo.; Magnolia Petroleum Company, Dallas, Tex.; General Petroleum Corporation, Los Angeles, Cal.; Vacuum Oil Company, Inc., New York; White Star Refining Company, Detroit, Mich.; Wadhams Oil Company, Milwaukee, Wis., and Lubrite Refining Company, St. Louis, Mo.

THE WORTHINGTON PUMP & MACHINERY CORPORATION, New York, will transfer and consolidate its designing, engineering and manufacturing activities formerly carried on at its Cincinnati, Ohio, works, with those of its Buffalo, N. Y., manufacturing plant, and the necessary members of the Cincinnati works organization are being transferred to Buffalo. For the present, the Cincinnati plant equipment will remain intact. This action in no way affects Worthington's Cincinnati district sales office, which is under the management of Earl Vinnedge.

ROBERT GREGG, president of the Atlantic Steel Company, Atlanta, Ga., has resigned from that company and will become vice-president of the Tennessee Coal, Iron & Railroad Company, a subsidiary of United States Steel Corporation, at Birmingham, Ala., succeeding Willard Wilson, for many years vice-president in charge of sales of the Tennessee Coal, Iron & Railroad Company, who will retire.

IRVING H. JONES, formerly western sales manager of the Molybdenum Corporation of America, has been appointed manager of railroad sales of the Timken Steel & Tube Company, Canton, Ohio. Mr.



Irving H. Jones

Jones held the position of western sales manager of the Molybdenum Corporation for several years, previous to which time he was for ten years manager of railroad sales of the Central Alloy Steel Corporation. He has been connected with the railway supply industry and active in association work for over twenty years, playing an important part in the creation of the Allied Railway Supply Association, of which he is now president.

THE PEERLESS EQUIPMENT COMPANY has recently been organized for the purpose of engaging in the general railway supply business. Floyd K. Mays has been elected president and A. A. Helwig, vice-president, with offices at 230 Park avenue, New York, and 310 S. Michigan boulevard, Chicago. Among other specialties and devices to be handled, the new company will market the various types of Peerless draft gears heretofore owned by the American Steel foundries.

ROSS F. HAYES, 50 Church street, New York, for many years with the Curtain Supply Company and later with the Adams & Westlake Company after the merger of those companies, is now handling the sale of supplies for steam and electric railways and bus companies. Mr. Hayes continues as eastern sales agent for the Henry Giessel Company, Chicago, water coolers, and the Hastings Signal & Equipment Company, Boston, Mass., bridge warnings, and is prepared to handle the products of additional railway supply manufacturers who may desire New York City and eastern territory sales representation.

CHARLES C. CLUFF, manager of sales of the New York district of the Carnegie Steel Company, with headquarters at New York, retired on July 1 after more than half a century in the steel business. James R. Mills, manager of sales at Cleveland, Ohio, succeeds Mr. Cluff and Francis C. Hardie, assistant manager of sales of the Illinois Steel Company at Chicago, succeeds Mr. Mills at Cleveland. Mr. Cluff entered the steel business in 1881 with the Iowa Barb Wire Company (now the Allentown plant of the American Steel & Wire Company), where he remained until he went into business for himself in 1890. In 1895 he became general eastern agent of the Illinois Steel Company and, with the organization of the United States Steel Corporation in 1901, he was appointed assistant manager of sales of both the Illinois Steel and the Carnegie Steel Companies. In 1910 Mr. Cluff became also manager of sales of the Tennessee Coal & Iron Company in the New York district.

James R. Mills, who succeeds Mr. Cluff as manager of sales in the New York district, has been manager of sales in the Cleveland district for the Carnegie Steel Company, the Illinois Steel Company and the Tennessee Coal & Iron Company for many years. Mr. Mills was born at Sewickley, Pa., and attended Allegheny College and Ohio State University, receiving his B.A. degree from the former institution. He has been with the Carnegie Steel Company since July 1, 1898, when he joined the staff of the Cleveland office as salesman. He later was manager of sales in that city and on March 1, 1905, he became assistant manager of sales of the St. Louis, Mo., district. In January, 1907, Mr. Mills was transferred to the New Orleans office as manager of sales and remained there until June, 1914, when he returned to the Cleveland office, also as manager of sales.

Francis C. Hardie, who succeeds Mr. Mills at Cleveland, has been assistant manager of sales of the Illinois Steel Company at Chicago. He was born at Evanston, Ill., and, after first attending the University of Illinois, received his B.A. degree at Dartmouth College in 1918. He entered the service of the Carnegie Steel Company in 1924 at the Duquesne, Pa., works. In June, 1925, he was transferred to the Cincinnati office as a salesman and in March, 1926, he was assigned to Indianapolis as resident salesman, where he remained until he was transferred to the Illinois Steel Company at Chicago, in April, 1929. He was appointed assistant manager of sales at Chicago on January 1, 1931.

GEORGE G. THORP, vice-president of the Illinois Steel Company, has been elected president, to succeed Eugene J. Buffington who retired on July 1 under the United States Steel Corporation's pension sys-

tem. Mr. Thorp was born at Pittsburgh, Pa., on June 29, 1868, and was graduated from the University of Wisconsin in 1891. He began his career as engineer of tests of the Illinois Steel Company at Chicago in 1892 and was appointed general superintendent of the Joliet Illinois Works in 1898. From 1901 until 1905 he constructed and operated the steel mills at Clairton, Pa., and in the latter year was elected vice-president of the Illinois Steel Company in charge of design, construction and operation of the Gary Steel Mills, Gary, Ind.

Eugene J. Buffington was born at Guyandotte, W. Va., on March 14, 1863, and graduated from Vanderbilt university in 1883. In 1884 he entered business as a manufacturer of wire nails, organizing the American Wire Nail Company, Covington, Ky., and occupying the position of treasurer. In 1889 the company was moved to Anderson, Ind., where he remained until 1898, when he became secretary and treasurer of the American Steel & Wire Co., Chicago. On January 1, 1899, he became president of the Illinois Steel Company, which position he has held until his retirement.

George Cook Kimball, who has been elected vice-president of the Illinois Steel Company, with headquarters at Chicago, to succeed Mr. Thorp was graduated from Harvard University in 1900. The following year he entered the steel industry in the engineering department of the American Tin Plate Company at Pittsburgh, Pa. In 1905 he was appointed chief engineer of the American Sheet & Tin Plate Company, and held that position until 1931 when he was elected a vice-president of that company.

LESTER T. BURWELL, until recently vice-president of the Q & C Company, New York, is now president of the Rails Company, Chrysler building, New York, a

Lester T. Burwell

newly-formed organization which is promoting the development and use of Airtrol air-conditioning and pre-cooling systems and other railroad equipment. Mr. Burwell first entered railroad service in 1910 with the M. W. Supply Company, Philadelphia, Pa., and was employed with that company for four years. Since 1914 he has served continuously in various capacities with the Q & C Company except for two years when he served with the United States Army. He was appointed vice-president of the Q & C Company in 1924 and held that position until July 1, 1932.

A. M. CASTLE & Co., Chicago, has been appointed the distributor of the Babcock & Wilcox Tube Company's products in the Chicago and Pacific Coast territories.

## Obituary

C. C. HOBART, president of the Hobart Brothers Co., Troy, Ohio, manufacturers of railway welding equipment, died at his home in Troy, on June 3.

JAMES BARRETT, a member of the sales staff of the Worthington Pump & Machinery Corporation, New York, died on June 22 at the Columbia Presbyterian Medical Center, New York, after a short illness. Mr. Barrett was born in Canada on October 14, 1866, and had been in the service of the Worthington Corporation for the past 40 years.

T. L. MILLER, vice-president of the Tuco Products Corporation, New York, with headquarters at Chicago, died on July 6 at the St. Francis hospital at Evanston, Ill., following an operation. Mr. Miller, who was 46 years of age, was born at Atlantic, Iowa, and after graduating from the Chicago high schools in 1903, he entered the employ of lumber and logging industries in eastern Texas. Returning

T. L. Miller

to Chicago, he entered the service of the General Railway Supply Company at that point four years later and until 1914 he was advanced successively through the positions of office assistant, chief clerk and assistant to the vice-president. On April 15 of that year, when the Tuco Products Corporation took over the General Railway Supply Company, Mr. Miller was assigned to special duties at New York, being transferred to Chicago a year later. During the World War he was in charge of the manufacturing department of the Tuco Products Corporation, after which he was placed in charge of the western office at Chicago, which position he was holding at the time of his election as vice-president in 1927.

# Personal Mention

## General

P. J. COLLIGAN, superintendent of shops of the Chicago, Rock Island & Pacific, at Silvis, Ill, has been appointed to the newly-created position of superintendent of motive power of the system, with headquarters at Kansas City, Mo., following the recent consolidation of the First and Second districts of the Rock Island.

GEORGE E. SMART, chief of car equipment of the Canadian National, is retiring because of ill-health, and the title of C. E. Brooks, chief of motive power, has been changed to chief of motive power and car equipment. Mr. Brooks

George E. Smart

will have charge of car equipment. Mr. Smart was born in Edinburgh, Scotland, on December 23, 1873. He began railroad service in 1892, in the car department of the Grand Trunk. He was connected with the Canadian Pacific from 1904 to 1913, holding successively the positions of general inspector, heating and lighting; general car inspector, and divisional car foreman, Eastern lines. In 1913, he became master car builder of the Canadian Government Railways (now C.N.R.), at Moncton, N. B., and in 1918, was removed to Toronto, Ont., as general master car builder of the Canadian National. In 1920, Mr. Smart's jurisdiction was extended to include the Grand Trunk Pacific lines and later in the same year he became mechanical assistant to the operating vice-president. In 1923, he was appointed chief of car equipment, with headquarters at Montreal. Mr. Smart served as vice-chairman of the Mechanical Division, American Railway Association, from 1926 to 1927, and as chairman from 1928 to 1930.

## Master Mechanics and Road Foremen

T. F. GORMAN, shop superintendent of the Erie at Meadville, Pa., has been appointed master mechanic at Meadville, and the position of shop superintendent has been abolished.

*(Turn to second left-hand page)*

# Alco Forgings

## Quality Materials, Ultra Modern Equipment, Precision Workmanship, Plus a Keen Sense of Responsibility Has Accomplished The Fulfillment of This Pledge . . . . . .

**QUALITY ALL WAYS—QUALITY ALWAYS is more than just a slogan—it is an Alco principle consistently adhered to, and an established practice for many years. The avowed purpose behind Alco Forgings is to make them, beyond question, the best that can be manufactured.**

**As locomotive builders, Alco is deeply concerned with keeping forging quality on the highest plane so that the locomotives will render a superior service for the fewest maintenance dollars.**

**Then too, as locomotive builders, Alco is qualified by long experience to interpret and execute specifications accurately and with maximum assurance that the forgings will meet your needs exactly.**

**And getting right down to dollars and cents, Alco quality results in operating and maintenance economies. Alco forgings, like Alco locomotives, point the sure road to profits.**

**American Locomotive Company**
**30 Church Street New York N.Y.**

W. E. HARMISON, assistant master mechanic of the Eastern district of the Erie at Jersey City, N. J., has been appointed master mechanic at Secaucus, N. J.

### Car Department

J. S. EAST, car inspector on the Pocahontas division of the Norfolk & Western, has been appointed car foreman, with headquarters at Lynchburg, Va.

D. E. ARMSTRONG has been appointed general car foreman of the Gulf, Colorado and Santa Fe, with headquarters at Cleburne, Tex., succeeding G. E. Weiler, retired.

### Shop and Enginehouse

S. E. MUELLER, assistant superintendent of shops of the Chicago, Rock Island & Pacific at Silvis, Ill., has been promoted to the position of superintendent of shops at that point, to succeed P. J. Colligan, and the position of assistant superintendent of shops has been abolished.

### Obituary

GEORGE A. MILLER, retired superintendent of motive power and machinery of the Florida East Coast, died on July 12. Mr. Miller was born on January 29, 1856, at Danvers, Mass., and entered railway service in 1878, as machinist apprentice with the Boston & Providence (now part of the New York, New Haven & Hartford). Later he served with the New York & New England (now also part of the N. Y., N. H. & H.). In 1892, he became connected with the Jacksonville, St. Augustine & Indian River (now the Florida East Coast), as general foreman of shops. In February, 1895, he was appointed acting master mechanic, and in November of that year he became master mechanic, which position he held until October 8, 1902, when he was appointed superintendent motive power and machinery. Mr. Miller retired on May 15, 1926.

LOUIS A. RICHARDSON, general superintendent of motive power of the Chicago, Rock Island & Pacific, with headquarters at Chicago, died on July 26 at his home in that city. Mr. Richardson was born on December 14, 1869, at Bucklin, Mo., and entered railway service in 1883, as a mechanical apprentice on the Kansas City, St. Joseph & Council Bluffs (now a part of the Chicago, Burlington & Quincy). Later he served in various capacities with the Union Pacific, the Southern Pacific, the Oregon Short Line, the Denver & Rio Grande, the New York Central and other lines, and in 1906 he entered the service of the Rock Island as a master mechanic at Trenton, Mo. In 1913, Mr. Richardson was promoted to mechanical superintendent of the second district with headquarters at El Reno, Okla., subsequently being transferred to the first district, with headquarters at Des Moines, Iowa. In 1926, he was promoted to general superintendent of motive power of the system, with headquarters at Chicago.

## Trade Publications

***Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioning it in the description.***

LOADMASTER.—Bulletin L-4 issued by the Bucyrus-Erie Company, South Milwaukee, Wis., gives specifications for, and illustrates many of the operations for which the Loadmaster is adapted.

VANADIUM ALLOY STEEL CASTINGS.—"Excellent Properties Developed by Vanadium Alloy Steel Castings" is the title of an eight-page bulletin issued by the Vanadium Corporation of America, 120 Broadway, New York. The material in this bulletin was prepared by engineers of the Vanadium Corporation for the Steel Founders' Society of America.

ELECTRIC FURNACES.—A wide variety of the applications of G-E direct-heat, metallic-resistor electric furnaces are illustrated and described in the 24-page Electric Furnaces catalog issued by the General Electric Company, Schenectady, N. Y. The furnaces are of the box, car, elevator, conveyor, pit, rotary-hearth and bell types.

## Among the Clubs and Associations

FIRE PROTECTION ASSOCIATION.—The annual meeting of the Railway Fire Protection Association, to be held at Cleveland, Ohio, will be confined to two days, October 18 and 19, to conserve time and expense. The first day of the meeting will be devoted to a discussion of immediate problems and solutions, while the second day will be taken up with reports from the standing committees. The Hand Book committee will make a report and will probably request decision as to whether to reprint, at this time, the revised hand book.

NEW YORK RAILROAD CLUB.—The annual outing of the New York Railroad Club was held on June 29 at the Westchester Country Club, Rye, N. Y., with 430 members and their guests in attendance. ¶ In the annual golf tournament, open to members and guests, the third annual open team championship for railroad and railroad supply companies was won by the Johns-Manville Corporation. The other golfing events included driving and putting contests for those who played in the golf tournament; also, similar contests for non-golfers. The interest this year was also very pronounced in the field games. ¶ In the evening dinner was served at the Westchester Country Club, during which time, following the address of George LeBoutillier, president of the New York Railroad Club, prizes were awarded to the successful contestants in the golf and other events. The committees were in charge of J. S. Doyle, general chairman, R. P. Townsend, assistant general chairman and R. F. O'Leary, field chairman.

## Directory

*The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:*

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal building, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I. — SAFETY SECTION. — J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H. streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church street.

MACHINE SHOP PRACTICE DIVISION. — Carlos de Zafra, care of A. S. M. E., 29 West Thirty-ninth street, New York.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—L. H. Morrison, associate editor, Power, 475 Tenth avenue, New York.

FUELS DIVISION.—A. D. Black, associate editor, Power, 475 Tenth avenue, New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash street, Winona, Minn.

MASTER BOILERMAKERS' ASSOCIATION. — A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—See Car Department Officers Association.

NATIONAL SAFETY COUNCIL—STEAM RAILROAD SECTION.—W. A. Booth, Canadian National, Montreal, Que.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY BUSINESS ASSOCIATION. — Frank W. Noxon, 1124 Woodward building, Washington, D. C.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett. Baltimore & Ohio, Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburg, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TRAVELING ENGINEER'S ASSOCIATION. — W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—J. H. Nash, 343 South Dearborn street, Chicago. Regular meetings, third Monday in each month.